ORIGINAL TO GENERAL FILES

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

OFFICE OF DESIGN POLICY & SUPPORT
INTERDEPARTMENTAL CORRESPONDENCE

FILE P.I. # 0009919
Newton County
GDOT District 2 - Tennille
SR 81 @ SR 162
Roundabout

OFFICE Design Policy & Support

DATE 12/14/2015

FROM for Brent Story, State Design Policy Engineer

TO SEE DISTRIBUTION

SUBJECT **APPROVED CONCEPT REPORT**

Attached is the approved Concept Report for the above subject project.

Attachment

DISTRIBUTION:

Glenn Bowman, Director of Engineering
Joe Carpenter, Director of P3/Program Delivery
Genetha Rice-Singleton, Assistant Director of P3/Program Delivery
Albert Shelby, State Program Delivery Engineer
Darryl VanMeter, State Innovative Delivery Engineer
Bobby Hilliard, Program Control Administrator
Cindy VanDyke, State Transportation Planning Administrator
Hiral Patel, State Environmental Administrator
Bill DuVall, State Bridge Engineer
Andrew Heath, State Traffic Engineer
Angela Robinson, Financial Management Administrator
Lisa Myers, State Project Review Engineer
Charles "Chuck" Hasty, State Materials Engineer
Lee Upkins, State Utilities Engineer
Richard Cobb, Statewide Location Bureau Chief
Andy Casey, State Roadway Design Engineer
Attn: Todd Price, District Design Engineer
Ed David Adams, State Safety Program Manager
Jimmy Smith, District Engineer
Neal O'Brien, District Preconstruction Engineer
Jamie Lindsey, District Utilities Engineer
Daniel Chastain, Project Manager
BOARD MEMBER - 4th Congressional District

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
PROJECT CONCEPT REPORT

Project Type: Roundabout
GDOT District: 2
Federal Route Number:
Project Number: N/A
P.I. Number: 0009919
County: Newton
State Route Number: 81 and 162

Intersection improvements on SR 81 @ SR 162 in Newton County

Submitted for approval: * updates received 11-17-15

D2-Design — 8/4/15
GDOT Concept/Design Phase Office Head & Office — Date

Albert Shelby — 8/19/15
State Program Delivery Engineer — Date

CCB — 8/5/15
GDOT Project Manager — Date

Recommendation for approval: *(Delete any inapplicable signature lines)*

* Hiral Patel/KLP — 9/15/15
State Environmental Administrator — Date

* Ken Werho/KLP — 8/28/15
State Traffic Engineer — Date

* Lisa Myers/KLP — 8/24/15
Project Review Engineer — Date

* Yulonda Pride-Foster/KLP — 8/27/15
FOR State Utilities Engineer — Date

* Jimmy Smith/KLP — 8/24/15
District Engineer — Date

* Recommendation on file

☒ MPO Area: This project is consistent with the MPO adopted Regional Transportation Plan (RTP)/Long Range Transportation Plan (LRTP).

☐ Rural Area: This project is consistent with the goals outlined in the Statewide Transportation Plan (SWTP) and/or is included in the State Transportation Improvement Program (STIP).

Cynthia K Vanike — 8-26-15
State Transportation Planning Administrator — Date

Georgia Department of Transportation

PROJECT LOCATION MAP

NOT TO SCALE

Georgia Department of Transportation

PLANNING AND BACKGROUND

Project Justification Statement: The proposed project will enhance safety and improve operational efficiency at the intersection of SR 81 at SR 162 in Newton County, GA. In Georgia, nearly a third of fatal crashes occur at intersections making intersection safety a focus area for the Georgia Department of Transportation. Nationally intersection crashes account for 40% of all reported crashes and approximately 20% of traffic fatalities. Of those fatalities, nearly 50% are the result of angle collisions. Angle collisions are often high speed, high impact crashes which often result in serious injuries or fatalities.

Roundabouts have been identified as one of nine proven countermeasures by the Federal Highway Administration (FHWA). The installation of roundabouts in comparison to traditional safety countermeasures such as traffic signals have resulted in a greater reduction in crash frequency and in many instances better operational efficiency. Roundabouts are generally navigated at slower speeds which correlate with lower impact, less severe crashes. A roundabout also presents fewer conflict points than a traditional intersections resulting in fewer collisions.

Crash data used to identify the need for a safety project at this location was taken from 2004-2008. This data indicated that 33 crashes occurred at this intersection resulting in 6 total injuries. Of those crashes 70% were angle crashes accounting for 50% of the injuries. Studies have shown that the installation of a roundabout results in nearly 80% reduction in series injury crashes and nearly 40% reduction in property damage crashes.

Existing conditions: SR 81 is a two lane urban minor arterial with an existing posted speed limit of 55 mph and an ADT of 7,050 vehicles per day. SR 162 is a two lane urban minor arterial with an existing posted speed limit of 45 mph and an ADT of 7,950 vehicles per day. Currently the intersection is all way stop controlled with no turn lanes on any of the approaches.

Other projects in the area: Currently there are no other programmed projects listed within this project area.

MPO: Atlanta Regional Commission (ARC) **TIP #:** N/A

TIA Regional Commission: Atlanta Regional Commission

Congressional District(s): 4

Federal Oversight: ☐ PoDI ☒ Exempt ☐ State Funded ☐ Other

Projected Traffic: ADT

Current Year (2013): SR 81 – 7,050 & SR 162 – 7,950

Open Year (2018): SR 81 – 7,925 & SR 162 – 9,175

Design Year (2038): SR 81 – 11,900 & SR 162 – 14,100

Traffic Projections Performed by: GDOT Office of Planning

Functional Classification (Mainline): Urban Principal Arterial – SR 81; Urban Minor Arterial – SR 162

Complete Streets - Bicycle, Pedestrian, and/or Transit Standard Warrants:
Warrants met: ☒ None ☐ Bicycle ☐ Pedestrian ☐ Transit

Is this a 3R (Resurfacing, Restoration, & Rehabilitation) Project? ☒ No ☐ Yes

Georgia Department of Transportation

Pavement Evaluation and Recommendations

Preliminary Pavement Evaluation Summary Report Required? ☒ No ☐ Yes
Preliminary Pavement Type Selection Report Required? ☒ No ☐ Yes
Feasible Pavement Alternatives: ☒ HMA ☐ PCC ☐ HMA & PCC

DESIGN AND STRUCTURAL

Description of the proposed project: The proposed project will reconstruct the existing, at-grade intersection of SR 81 at SR 162 in Newton County to a four-legged roundabout. This intersection is located 2.9 miles southwest of the City of Covington on SR 81 in Newton County. The project length is estimated to be 0.43 mile on SR 81 and 0.24 mile on SR 162. Traffic will be maintained on-site and staged during the construction of the project.

Major Structures: N/A

Mainline Design Features:

SR 81 – Urban Principal Arterial

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**2**	**2**	**2 on roadway, 2 Circular lanes within roundabout**
- **Lane Width(s)**	**12'**	**12'**	**12'- 20' Lanes – Widths will vary for roundabout design**
- **Median Width & Type**	**N/A**	**N/A**	**Roundabout Splitter Island - Varies, Raised**
- **Outside Shoulder or Border Area Width**	**0'**	**N/A**	**10'**
- **Outside Shoulder Slope**	**N/A**	**N/A**	**6%**
- **Inside Shoulder Width**	**N/A**	**N/A**	**N/A**
- **Sidewalks**	**N/A**	**5'**	**5'**
- **Auxiliary Lanes**	**N/A**	**N/A**	**N/A**
- **Bike Lanes**	**N/A**	**N/A**	**N/A**
Posted Speed	**55 mph**		**45 mph**
Design Speed	**55 mph**	**55 mph**	**45 mph for intersection approaches, 30 mph in roundabout**
Min Horizontal Curve Radius	**1190'**	**1190'**	**1190'**
Maximum Superelevation Rate	**-**	**4% (max)**	**4%**
Maximum Grade	**-**	**7% (max)**	**6%**
Access Control	**Permit**	**Permit**	**Permit**
Design Vehicle	**SU**	**SU - WB-67**	**SU - WB-67**
Pavement Type	**HMA**	**HMA**	**HMA**

*According to current GDOT design policy if applicable

Georgia Department of Transportation

SR 162 – Urban Minor Arterial

Feature	Existing	Standard*	Proposed
Typical Section			
- Number of Lanes	2	2	2 on roadway, 1 Circular lane within roundabout
- Lane Width(s)	12'	12'	12'- 20' Lanes – Widths will vary for roundabout design
- Median Width & Type	N/A	N/A	Roundabout Splitter Island - Varies, Raised
- Outside Shoulder or Border Area Width	2'	N/A	10'
- Outside Shoulder Slope	6%	N/A	6%
- Inside Shoulder Width	N/A	N/A	N/A
- Sidewalks	N/A	5'	5'
- Auxiliary Lanes	N/A	N/A	N/A
- Bike Lanes	N/A	N/A	N/A
Posted Speed	45 mph		45 mph
Design Speed	45 mph	45 mph	45 mph for intersection approaches, 30 mph in roundabout
Min Horizontal Curve Radius	711'	711'	711'
Maximum Superelevation Rate	-	4% (max)	4%
Maximum Grade	5%	7% (max)	5%
Access Control	Permit	Permit	Permit
Design Vehicle	SU	SU - WB-67	SU - WB-67
Pavement Type	HMA	HMA	HMA

*According to current GDOT design policy if applicable

Major Interchanges/Intersections: SR 81 and SR 162

Lighting required: ☐ No ☒ Yes

Off-site Detours Anticipated: ☒ No ☐ Yes ☐ Undetermined

Transportation Management Plan [TMP] Required: ☐ No ☒ Yes KLP

If Yes: Project classified as: ☐ Non-Significant ☐ Significant

TMP Components Anticipated: ☒ TTC ☐ TO ☐ PI

Georgia Department of Transportation

Design Exceptions to FHWA/AASHTO controlling criteria anticipated:

FHWA/AASHTO Controlling Criteria	No	Undeter-mined	Yes	Appvl Date (if applicable)
1. Design Speed	☒	☐	☐	
2. Lane Width	☒	☐	☐	
3. Shoulder Width	☒	☐	☐	
4. Bridge Width	☒	☐	☐	
5. Horizontal Alignment	☒	☐	☐	
6. Superelevation	☒	☐	☐	
7. Vertical Alignment	☒	☐	☐	
8. Grade	☒	☐	☐	
9. Stopping Sight Distance	☒	☐	☐	
10. Cross Slope	☒	☐	☐	
11. Vertical Clearance	☒	☐	☐	
12. Lateral Offset to Obstruction	☒	☐	☐	
13. Bridge Structural Capacity	☒	☐	☐	

Design Variances to GDOT Standard Criteria anticipated:

GDOT Standard Criteria	Reviewi ng Office	No	Undeter--mined	Yes	Appvl Date (if applicable)
1. Access Control/Median Openings	DP&S	☒	☐	☐	
2. Intersection Sight Distance	DP&S	☒	☐	☐	
3. Intersection Skew Angle	DP&S	☒	☐	☐	
4. Lateral Offset to Obstruction	DP&S	☒	☐	☐	
5. Rumble Strips	DP&S	☒	☐	☐	
6. Safety Edge	DP&S	☒	☐	☐	
7. Median Usage	DP&S	☒	☐	☐	
8. Roundabout Illumination Levels	DP&S	☒	☐	☐	
9. Complete Streets	DP&S	☒	☐	☐	
10. ADA & PROWAG	DP&S	☒	☐	☐	
11. GDOT Construction Standards	DP&S	☒	☐	☐	
12. GDOT Drainage Manual	DP&S	☒	☐	☐	
13. GDOT Bridge & Structural Manual	Bridges	☒	☐	☐	

VE Study anticipated: ☒ No ☐ Yes ☐ Completed – Date:

UTILITY AND PROPERTY

Temporary State Route needed: ☒ No ☐ Yes ☐ Undetermined

Railroad Involvement: N/A

Utility Involvements: Snapping Shoals – Power, Snapping Shoals – Fiber, AT&T – Phone, Atlanta Gas Light Resources – Gas, Charter Communications – Phone, Newton County Water and Sewer.
Project Specific Recommendations for Avoidance/Mitigation: AT&T Remote Terminal Site

Georgia Department of Transportation

SUE Required: ☐ No ☒ Yes ☐ Undetermined

Public Interest Determination Policy and Procedure recommended? ☒ No ☐ Yes
Right-of-Way (ROW): Existing width: 60-100ft. Proposed width: 86-160ft.
Required Right-of-Way anticipated: ☐ None ☒ Yes ☐ Undetermined
Easements anticipated: ☐ None ☒ Temporary ☒ Permanent ☒ Utility ☐ Other

Anticipated total number of impacted parcels: 7
Displacements anticipated: Businesses: 3
Residences: 0
Other: 0
Total Displacements: 1

Location and Design approval: ☐ Not Required ☒ Required

ROUNDABOUTS

Roundabout Lighting Agreement/Commitment Letter received: ☐ No ☒ Yes
A letter was sent from the Department on February 25, 2011 asking for Newton County Board of Commissioners to provide an Agreement/Commitment in support of a roundabout. A letter dated April 5th 2011 was received from the County indicating their support for roundabout consideration at this location. A copy of that letter is attached.

Roundabout Planning Level Assessment: N/A

Roundabout Feasibility Study: A feasibility study was performed for this intersection which evaluated leaving the intersection "as is" functioning as an all way stop, reconstructing the intersection to function under the control of a stop and go traffic signal, and reconstructing the intersection to a roundabout. The findings of that study found that the roundabout is the most feasible alternative for this location. A copy of that study is attached to this report.

Roundabout Peer Review Required: ☐ No ☒ Yes ☒ Completed – Date: 6/18/2015

CONTEXT SENSITIVE SOLUTIONS

Issues of Concern: N/A

Context Sensitive Solutions Proposed: N/A

ENVIRONMENTAL & PERMITS

Anticipated Environmental Document:
GEPA: ☐ **NEPA:** ☒ CE ☐ EA/FONSI ☐ EIS

MS4 Permit Compliance – Is the project located in a MS4 area? ☐ No ☒ Yes

Georgia Department of Transportation

Environmental Permits/Variances/Commitments/Coordination anticipated:

Permit/ Variance/ Commitment/ Coordination Anticipated	No	Yes	Remarks
1. U.S. Coast Guard Permit	☒	☐	
2. Forest Service/Corps Land	☒	☐	
3. CWA Section 404 Permit	☒	☐	
4. Tennessee Valley Authority Permit	☒	☐	
5. Buffer Variance	☒	☐	
6. Coastal Zone Management Coordination	☒	☐	
7. NPDES	☐	☒	
8. FEMA	☒	☐	
9. Cemetery Permit	☒	☐	
10. Other Permits	☒	☐	
11. Other Commitments	☒	☐	
12. Other Coordination	☒	☐	

Is a PAR required? ☒ No ☐ Yes ☐ Completed – Date:

Environmental Comments and Information:

NEPA/GEPA: *N/A*

Ecology: A summary of the federal and state threatened and endangered species listed within a three mile radius of the project, their federal status, and suitable habitat requirements is included in the table below.

Scientific Name	Common Name	State Status	Federal Status	Type	Habitat Requirements
Cambarus harti	Piedmont Blue Burrower	E	None	Crustacean	Complex burrows adjacent to streams and seepage areas, or in low areas where the water table is near the surface of the ground.
Cyprinella xaenura	Altamaha Shiner	T	None	Fish	Altamaha shiners inhabit small tributaries and rivers. They are most often found in small pools with rocky to sandy substrates.
Amphianthus pusillus	Pool Sprite	T	T	Plant	Shallow, flat-bottomed depressions (solution pits, vernal pools) on granite outcrops, with thin, gravelly soils and winter-spring inundation. Pools must be deep enough to hold water for several weeks and must be in full sun.
Eriocaulon koernickianum	Dwarf Hatpins	E	None	Plant	Seepage areas and wet depressions on Piedmont granite flat rocks, often with horned bladderwort. In other states, Dwarf Hatpins occurs in wet seeps on sandstone outcrops and in pineland bogs.
Isoetes melanospora	Black-spored Quillwort	E	E	Plant	Shallow, temporarily flooded, flat-bottomed pools formed by natural erosion on granite outcrops. The pools are seasonally inundated by winter and early spring rains and by seepage from surrounding habitats; they are usually completely dry during the summer and fall.
Rhus michauxii	Dwarf Sumac	E	E	Plant	Dry, open, rocky, or sandy woodlands over mafic bedrock with high levels of calcium, magnesium, or iron; often on ridges and river bluffs.

Georgia Department of Transportation

History: N/A

Archeology: N/A

Air Quality:

Is the project located in a PM 2.5 Non-attainment area? ☐ No ☒ Yes
Is the project located in an Ozone Non-attainment area? ☐ No ☒ Yes
Carbon Monoxide hotspot analysis: ☐ Required ☒ Not Required ☐ TBD
This project will be evaluated for it consistency with state and federal air quality goals, including CO, Ozone, PM 2.5 and MSATS as part of the assessment.

Noise Effects: Noise Screening Assessment for Type III Projects.

Public Involvement: PIOH to be scheduled after approval of concept.

Major stakeholders: Business located in and around the intersection. BP Gas Station in western quadrant, Citgo gas station located in the southern quadrant, and a Dollar General discount retail store located in the eastern quadrant of the intersection.

CONSTRUCTION

Issues potentially affecting constructability/construction schedule: Staging due to high traffic volumes.

Early Completion Incentives recommended for consideration: ☒ No ☐ Yes

COORDINATION, ACTIVITIES, RESPONSIBILITIES, AND COSTS

Initial Concept Meeting: N/A

Concept Meeting: July 21, 2015. Team agreed to proceed with the single lane roundabout design on a multi-lane roundabout footprint. Meeting minutes are attached.

Other coordination to date: N/A

Project Activity	Party Responsible for Performing Task(s)
Concept Development	GDOT – District 2
Design	GDOT – District 2
Right-of-Way Acquisition	GDOT – District 2
Utility Relocation	Utility Owners
Utility Coordination	GDOT – District 2
Letting to Contract	GDOT – District 2
Construction Supervision	GDOT – District 2
Providing Material Pits	Contractor
Providing Detours	Contractor
Environmental Studies, Documents, & Permits	GDOT
Environmental Mitigation	GDOT
Construction Inspection & Materials Testing	GDOT

Georgia Department of Transportation

Project Cost Estimate Summary and Funding Responsibilities:

	Breakdown of PE	ROW	Reimbursable Utility	CST*	Environmental Mitigation	Total Cost
Funded By	GDOT	GDOT	GDOT	GDOT	GDOT	
$ Amount	$374,895	$2,631,000	$33,802	$1,628,986	$0	$4,668,683
Date of Estimate	1/24/2012	10/20/2015	2/26/2015	11/16/2015	11/1/2013	

*CST Cost includes: Construction, Engineering and Inspection, Contingencies and Liquid AC Cost Adjustment.

ALTERNATIVES DISCUSSION

Preferred Alternative: This alternative would reconstruct the existing, at-grade intersection of SR 81 at SR 162 in Newton County to a four-legged single lane roundabout on a partial multi-lane roundabout footprint to allow for additional future capacity. The intersection would run as a single lane roundabout upon opening at base year. Channelization islands and additional striping would be installed in the areas where future lanes would be utilized. Once traffic volumes dictate minor construction, repaving, and striping would occur to convert the single lane operation to a partial multi-lane roundabout operation.

Estimated Property Impacts:	**7**	**Estimated Total Cost:**	**$4,668,683**
Estimated ROW Cost:	**$2,631,000.00**	**Estimated CST Time:**	**12 Months**

Rationale: This alternative would improve on safety, LOS, and decrease on overall intersection delay. Based on the traffic analysis outlined in the Feasibility Study this Alternative would be the best solution to accommodate traffic volumes in the Base Year and it would allow for an easy conversion to a partial multi-lane design when traffic volumes dictate some estimated 10-15 years out. Estimated cost to re-stripe and re-sign the roundabout at that time is $30,000. Utilizing the single lane roundabout design at Base Year will result in fewer conflict points and would allow motorists in this region to become accustom to how roundabouts function prior to introducing them to the Design Year multi-lane roundabout operation.

No-Build Alternative: Intersection would not be modified or reconstructed.

Estimated Property Impacts:	**N/A**	**Estimated Total Cost:**	**N/A**
Estimated ROW Cost:	**N/A**	**Estimated CST Time:**	**N/A**

Rationale: This alternative would not address the need and purpose of this project.

Alternative 1: This Alternate would reconstruct the existing, at-grade intersection of SR 81 at SR 162 in Newton County to a single lane roundabout.

Estimated Property Impacts:	**7**	**Estimated Total Cost:**	**$4,412,238**
Estimated ROW Cost:	**$2,631,000.00**	**Estimated CST Time:**	**12 Months**
		Projected Future Reconstruction Cost:	**$783,661**

Rationale: This alternative would improve on safety, LOS, and decrease the overall intersection delay. Based on the traffic analysis outlined in the Feasibility Study this Alternative would accommodate the base year traffic but LOS and delay would deteriorate and the need for additional intersection capacity would be needed prior to reaching Design Year Traffic Volumes. The single lane roundabout would need to be re-constructed at that time to a multi-lane roundabout design to accommodate for the additional capacity. Future additional re-construction cost would be incurred at that time. A projected future reconstruction cost is shown above to account for the cost it would take to reconstruct a single lane roundabout to a partial dual lane roundabout. This figure shown above is current reconstruction construction cost inflated at 3.5% a year for 12 years.

Georgia Department of Transportation

Alternative 2: This Alternate would reconstruct the existing, at-grade intersection of SR 81 at SR 162 in Newton County from an all-way stop condition to a signalized intersection at the intersection's current location.			
Estimated Property Impacts:	**7**	**Estimated Total Cost:**	**$4,702,276**
Estimated ROW Cost:	**$2,929,000.00**	**Estimated CST Time:**	**12 Months**
Rationale: This alternative will have both higher construction and ROW cost as opposed to the preferred alternative. There will also be future maintenance cost that the Department will incur with the up keep of a stop and go traffic signal. This alternative is not recommended due to the overall extra cost and future traffic signal maintenance cost associated with its implementation.			

Alternative 3: This Alternate would reconstruct and relocate the existing, at-grade intersection of SR 81 at SR 162 in Newton County from an all-way stop condition to a signalized intersection. This alternative would reconstruct the intersection approximately 550' West to allow for a better intersecting angle.			
Estimated Property Impacts:	**10**	**Estimated Total Cost:**	**$5,052,279**
Estimated ROW Cost:	**$3,097,000.00**	**Estimated CST Time:**	**12 Months**
Rationale: This alternative will have both higher construction and ROW cost as opposed to the preferred alternative. There will also be future maintenance cost that the Department will incur with the up keep of a stop and go traffic signal. This alternative is not recommended due to the overall extra cost and future traffic signal maintenance cost associated with its implementation.			

LIST OF ATTACHMENTS/SUPPORTING DATA

1. Concept Layout (Both Intermediate and Future Final Designs are attached)
2. Typical sections
3. Detailed Cost Estimates:
    a. Construction including Engineering and Inspection and Contingencies
    b. Completed Liquid AC Cost Adjustment forms
    c. Right-of-Way
    d. Utilities
    e. Environmental Mitigation (EPD, etc.)
4. Traffic diagrams
5. Accident Data
6. Roundabout
    a. Roundabout feasibility study
    b. Lighting agreement or commitment letter
    c. Peer Review comments
7. Minutes of Concept meetings

APPROVALS

Concur: Glen Brown
Director of Engineering

Approve: Margaret B. Pinkelo — 12/9/15
Chief Engineer — Date

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA			

SCALE IN FEET
0 50 100 200

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE:

MISCELLANEOUS MAPS

DRAWING NO.
12-

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA			

SCALE IN FEET
0 50 100 200

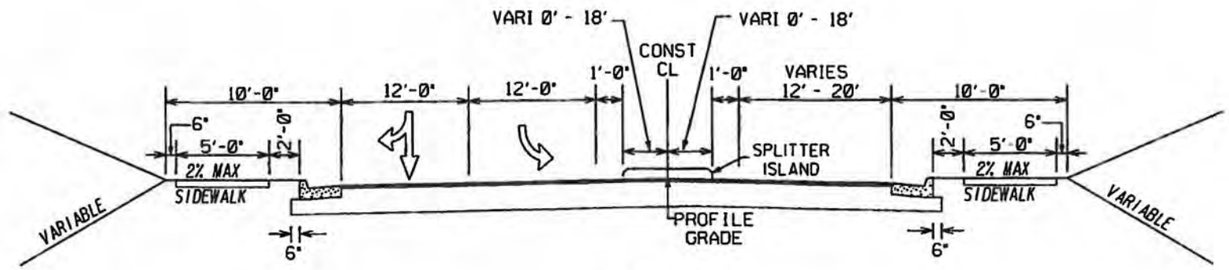
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

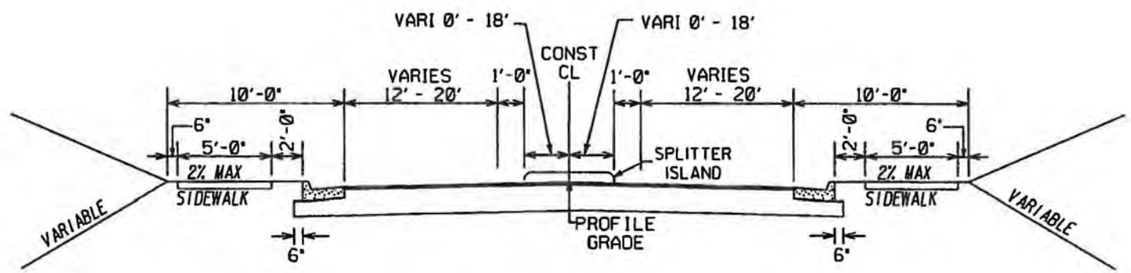
OFFICE:

MISCELLANEOUS MAPS

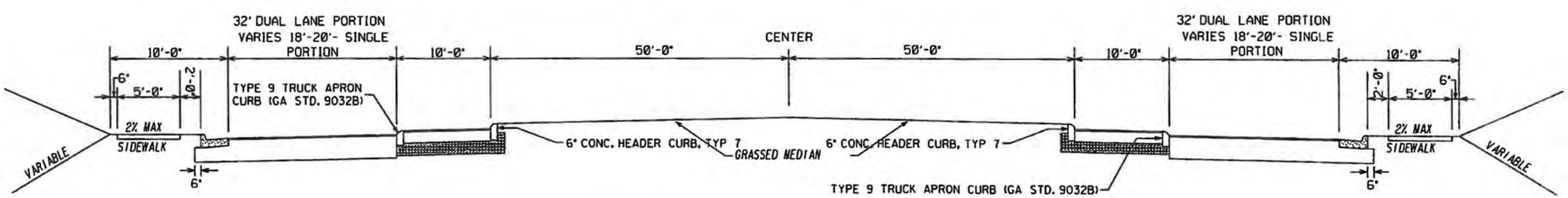
DRAWING NO.
12-



SR 81



SR 162



CENTER OF ROUNDABOUT

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE P.I. No. 9919

OFFICE D2 Design

PROJECT DESCRIPTION

SR 81 at SR 162 Intersection Safety Project

DATE November 16, 2015

From: Todd Pirce, District Design Engineer

To: Lisa L. Myers, State Project Review Engineer

Subject: REVISIONS TO PROGRAMMED COSTS

PROJECT MANAGER Daniel Chastain

MGMT LET DATE 11/15/2017

MGMT ROW DATE 8/15/2016

PROGRAMMED COSTS (TPro W/OUT INFLATION)			**LAST ESTIMATE UPDATE**	
CONSTRUCTION	$	894,311.87	DATE	10/1/2014
RIGHT OF WAY	$	428,000.00	DATE	8/5/2013
UTILITIES	$	33,802.00	DATE	3/4/2015

REVISED COST ESTIMATES

CONSTRUCTION*	$	1,628,985.61
RIGHT OF WAY	$	2,631,000.00
UTILITIES	$	

*Cost Contains 10 % Contingency

REASONS FOR COST INCREASE AND CONTINGENCY JUSTIFICATION:

The costs are based on plans at a stage between concept development and PFPR.

CONTINGENCY SUMMARY

A. CONSTRUCTION COST ESTIMATE:	$ 1,355,855.17	Base Estimate From CES		
B. ENGINEERING AND INSPECTION (E & I):	$ 67,792.76	Base Estimate (A) x	5	%
C. CONTINGENCY:	$ 142,364.79	Base Estimate (A) + E & I (B) x See % Table in "Risk Based Cost Estimation" Memo	10	%
D. TOTAL LIQUID AC ADJUSTMENT:	$ 62,972.89	Total From Liquid AC Spreadsheet		
E. CONSTRUCTION TOTAL:	$ 1,628,985.61	(A + B + C + D = E)		

REIMBURSABLE UTILTY COSTS

UTILITY OWNER	REIMBURSABLE COST
Snapping Shoals Power	$ 22,858.00
Snapping Shoals Fiber	$ 10,944.00
TOTAL	$ 33,802.00

ATTACHMENTS:

Detailed Cost Estimate Printout From TRAQS
Liquid AC Adjustment Spreadsheet

DETAILED COST ESTIMATE

Georgia Department of Transportation

Job: 0009919_2LN-RA

JOB NUMBER *0009919_2LN-RA* **FED/STATE PROJECT NUMBER**

SPEC YEAR: *01*

DESCRIPTION: *INTERSECTION IMPROVEMENTS SR 81 @ SR 162*

SINGLE LANE ROUNDABOUT

ITEMS FOR JOB 0009919_2LN-RA

1 - ROADWAY

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0005	150-1000	1.000	LS	$50,000.00000	TRAFFIC CONTROL - 0009919	$50,000.00
0010	210-0100	1.000	LS	$115,000.00000	GRADING COMPLETE - 0009919	$115,000.00
0030	310-1101	5300.000	TN	$22.38843	GR AGGR BASE CRS, INCL MATL	$118,658.68
0215	402-1812	1373.000	TN	$80.84168	RECYL AC LEVELING,INC BM&HL	$110,995.63
0015	402-3103	1100.000	TN	$100.23256	REC AC 9.5 MM SP,TPII,GP2, INCL BM & H L	$110,255.82
0025	402-3121	1550.000	TN	$76.39748	RECYL AC 25MM SP,GP1/2,BM&HL	$118,416.09
0020	402-3190	935.000	TN	$87.52778	RECYL AC 19 MM SP,GP 1 OR 2 ,INC BM&HL	$81,838.47
0035	413-1000	1450.000	GL	$4.35347	BITUM TACK COAT	$6,312.53
0220	430-0200	350.000	SY	$95.00000	PLN PC CONC PVMT/CL1C/ 10" TK	$33,250.00
0225	441-0104	713.000	SY	$31.71428	CONC SIDEWALK, 4 IN	$22,612.28
0040	441-0300	4.000	EA	$1,121.18000	CONC SPILLWAY, SPCL DES	$4,484.72
0045	441-0740	907.000	SY	$27.23476	CONC MEDIAN, 4 IN	$24,701.93
0230	441-5008	302.000	LF	$11.04799	CONC HEADER CURB, 6 IN, TP 7	$3,336.49
0235	441-5025	365.000	LF	$16.00000	CONC HEADER CURB, 4", TP 9	$5,840.00
0060	441-6222	1928.000	LF	$13.43631	CONC CURB & GUTTER/ 8"X30"TP2	$25,905.21
0065	446-1100	2420.000	LF	$4.37835	PVMT REF FAB STRIPS, TP2,18 INCH WIDTH	$10,595.61
0240	550-1180	196.000	LF	$42.88786	STM DR PIPE 18",H 1-10	$8,406.02
0245	550-1240	188.000	LF	$49.78465	STM DR PIPE 24",H 1-10	$9,359.51
0250	550-1300	58.000	LF	$67.78224	STM DR PIPE 30",H 1-10	$3,931.37
0255	550-2180	240.000	LF	$30.53879	SIDE DR PIPE 18",H 1-10	$7,329.31
0260	550-3318	4.000	EA	$638.89867	SAFETY END SECTION 18",STD,4:1	$2,555.59
0265	550-3324	2.000	EA	$793.93722	SAFETY END SECTION 24",STD,4:1	$1,587.87
0270	550-3330	2.000	EA	$1,235.04167	SAFETY END SECTION 30",STD,4:1	$2,470.08
0275	550-3518	10.000	EA	$663.62796	SAFETY END SECTION 18",STD,6:1	$6,636.28
0280	611-3010	1.000	EA	$1,627.70624	RECONSTR DROP INLET, GROUP 1	$1,627.71
0075	634-1200	32.000	EA	$111.35540	RIGHT OF WAY MARKERS	$3,563.37
0285	668-1100	5.000	EA	$2,203.72909	CATCH BASIN, GP 1	$11,018.65
0290	668-2100	5.000	EA	$2,060.10797	DROP INLET, GP 1	$10,300.54
0295	668-5000	4.000	EA	$1,578.09341	JUNCTION BOX	$6,312.37
					SUBTOTAL FOR ROADWAY:	**$917,302.13**

CONFIDENTIALITY NOTICE: This document may contain confidential and/or privileged information. Any unauthorized duplication, disclosure, distribution/ retransmission or taking of any action in reliance upon the material in this document is strictly forbidden.

DETAILED COST ESTIMATE

Georgia Department of Transportation

Job: 0009919_2LN-RA

2 - TEMP EROSION CONTROL

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0080	163-0232	4.000	AC	$465.36962	TEMPORARY GRASSING	$1,861.48
0085	163-0240	105.000	TN	$202.82841	MULCH	$21,296.98
0090	163-0300	3.000	EA	$1,094.61801	CONSTRUCTION EXIT	$3,283.85
0300	163-0528	44.000	LF	$4.33497	CONSTR AND REM FAB CK DAM -TP C SLT FN	$190.74
0305	163-0550	18.000	EA	$118.88753	CONS & REM INLET SEDIMENT TRAP	$2,139.98
0095	165-0030	1400.000	LF	$0.68962	MAINT OF TEMP SILT FENCE, TP C	$965.47
0310	165-0030	1056.000	LF	$0.71678	MAINT OF TEMP SILT FENCE, TP C	$756.92
0100	165-0101	3.000	EA	$445.76116	MAINT OF CONST EXIT	$1,337.28
0315	165-0105	18.000	EA	$48.38557	MAINT OF INLET SEDIMENT TRAP	$870.94
0105	167-1000	8.000	EA	$344.56707	WATER QUALITY MONITORING AND SAMPLING	$2,756.54
0110	167-1500	12.000	MO	$341.61192	WATER QUALITY INSPECTIONS	$4,099.34
0115	171-0030	2800.000	LF	$3.18156	TEMPORARY SILT FENCE, TYPE C	$8,908.37
0120	700-8000	1.000	TN	$562.76490	FERTILIZER MIXED GRADE	$562.76
					SUBTOTAL FOR TEMP EROSION CONTROL:	**$49,030.65**

3 - EROSION CONTROL

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0130	603-2181	169.000	SY	$37.65422	STN DUMPED RIP RAP, TP 3, 18"	$6,363.56
0135	700-6910	7.000	AC	$942.24025	PERMANENT GRASSING	$6,595.68
0320	700-7000	21.000	TN	$91.90723	AGRICULTURAL LIME	$1,930.05
0140	700-8000	10.000	TN	$497.09353	FERTILIZER MIXED GRADE	$4,970.94
0145	700-8100	350.000	LB	$2.47747	FERTILIZER NITROGEN CONTENT	$867.11
0150	716-2000	4770.000	SY	$1.10163	EROSION CONTROL MATS, SLOPES	$5,254.78
					SUBTOTAL FOR EROSION CONTROL:	**$25,982.12**

CONFIDENTIALITY NOTICE: This document may contain confidential and/or privileged information. Any unauthorized duplication, disclosure, distribution/ retransmission or taking of any action in reliance upon the material in this document is strictly forbidden.

DETAILED COST ESTIMATE

Georgia Department of Transportation

Job: 0009919_2LN-RA

4 - SIGNING AND MARKING

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0375	615-1200	730.000	LF	$12.60490	DIRECTIONAL BORE - 2 INCH	$9,201.58
0155	636-1020	77.000	SF	$14.45583	HWY SGN,TP1MAT,REFL SH TP3	$1,113.10
0160	636-1033	40.000	SF	$18.98175	HWY SIGNS, TP1MAT,REFL SH TP 9	$759.27
0325	636-1036	24.000	SF	$17.00000	HWY SIGNS, TP1 MATL,REFL SH, TP 11	$408.00
0165	636-1041	246.000	SF	$36.61432	HWY SIGNS,TP 2MAT,REFL SH TP 9	$9,007.12
0170	636-2070	684.000	LF	$5.79281	GALV STEEL POSTS, TP 7	$3,962.28
0175	652-0120	3.000	EA	$50.49961	PAVEMENT MARKING, ARROW, TP 2	$151.50
0355	652-6301	155.000	GLF	$0.38614	SKIP TRAF STRIPE, 6 IN, WHITE	$59.85
0200	652-9002	2023.000	SY	$1.75788	TRAFFIC STRIPE, YELLOW	$3,556.19
0330	653-0130	7.000	EA	$80.96935	THERM PVMT MARK, ARROW, TP 3	$566.79
0335	653-0130	7.000	EA	$80.96935	THERM PVMT MARK, ARROW, TP 3	$566.79
0180	653-1501	7520.000	LF	$0.37678	THERMO SOLID TRAF ST 5 IN, WHI	$2,833.39
0340	653-1502	8820.000	LF	$0.34679	THERMO SOLID TRAF ST, 5 IN YEL	$3,058.69
0345	653-1704	64.000	LF	$6.34477	THERM SOLID TRAF STRIPE,24",WH	$406.07
0350	653-1804	1010.000	LF	$2.21041	THERM SOLID TRAF STRIPE, 8",WH	$2,232.51
0360	653-6006	2023.000	SY	$3.63295	THERM TRAF STRIPING, YELLOW	$7,349.46
0205	654-1001	80.000	EA	$4.39580	RAISED PVMT MARKERS TP 1	$351.66
0365	654-1001	80.000	EA	$4.39580	RAISED PVMT MARKERS TP 1	$351.66
0210	654-1003	10.000	EA	$4.31984	RAISED PVMT MARKERS TP 3	$43.20
0370	654-1003	10.000	EA	$4.31984	RAISED PVMT MARKERS TP 3	$43.20
0380	681-0515	2.000	EA	$2,600.00000	LTG STD, ST, 15 FT MH	$5,200.00
0385	681-0525	27.000	EA	$2,700.00000	LTG STD, ST, 25 FT MH	$72,900.00
0390	681-5250	2.000	EA	$650.00000	LUMIN BRACKET ARM, 4 FT ARM	$1,300.00
0395	681-5260	27.000	EA	$675.00000	LUMIN BRACKET ARM, 8 FT ARM	$18,225.00
0400	681-6305	3.000	EA	$800.00000	LUMINAIRE, TP 3, 60 W, 30 LED	$2,400.00
0405	681-6310	1.000	EA	$850.00000	LUMINAIRE,TP 3, 90 W, LED	$850.00
0410	681-6316	1.000	EA	$950.00000	LUMINAIRE,TP 3, 130 W, LED	$950.00
0420	681-6395	9.000	EA	$850.00000	LUMINAIRE, TP 4, 65 W, 49 LED	$7,650.00
0415	681-6400	1.000	EA	$700.00000	LUMINAIRE,TP 4, 60 W, LED	$700.00
0425	681-6405	4.000	EA	$700.00000	LUMINAIRE,TP 4, 90 W, LED	$2,800.00
0430	681-6410	4.000	EA	$850.00000	LUMINAIRE,TP 4, 105 W, LED	$3,400.00
0435	681-6412	6.000	EA	$800.00000	LUMINAIRE,TP 4, 130 W, LED	$4,800.00
0440	682-1504	12502.000	LF	$1.00301	CABLE, TP RHH/RHW, AWG NO 10	$12,539.63
0445	682-6219	2078.000	LF	$5.78688	CONDUIT, NONMETL, TP 2, 1 IN	$12,025.14
0450	682-6230	730.000	LF	$10.00000	CONDUIT, NONMETL, TP 3, 1 IN	$7,300.00
0455	682-9000	1.000	LS	$14,000.00000	MAIN SVC PICK UP POINT 0009919	$14,000.00
					SUBTOTAL FOR SIGNING AND MARKING:	**$213,062.08**

TOTALS FOR JOB 0009919_2LN-RA

ITEMS COST:	$1,205,376.98
COST GROUP COST:	$0.00
ESTIMATED COST:	$1,355,885.17
CONTINGENCY PERCENT:	0.10
ENGINEERING AND INSPECTION:	0.05
ESTIMATED COST WITH CONTINGENCY AND E&I:	$1,559,267.95

CONFIDENTIALITY NOTICE: This document may contain confidential and/or privileged information. Any unauthorized duplication, disclosure, distribution/ retransmission or taking of any action in reliance upon the material in this document is strictly forbidden.

PROJ. NO.		CALL NO.	9/29/2009
P.I. NO.	0009919		
DATE	11/16/2015		

INDEX (TYPE)	DATE	INDEX
REG. UNLEADED	Nov-15	$ 2.054
DIESEL		$ 2.430
LIQUID AC		$ 413.00

Link to Fuel and AC Index:
http://www.dot.ga.gov/doingbusiness/Materials/Pages/asphaltcementindex.aspx

LIQUID AC ADJUSTMENTS

PA=[((APM-APL)/APL)]xTMTxAPL

Asphalt

Price Adjustment (PA)				**61429.62**	**$ 61,429.62**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	660.80	
Monthly Asphalt Cement Price month project let (APL)			$	413.00	
Total Monthly Tonnage of asphalt cement (TMT)				247.9	

ASPHALT	Tons	%AC	AC ton
Leveling	1373	5.0%	68.65
12.5 OGFC		5.0%	0
12.5 mm		5.0%	0
9.5 mm SP	1100	5.0%	55
25 mm SP	1550	5.0%	77.5
19 mm SP	935	5.0%	46.75
	4958		**247.9**

BITUMINOUS TACK COAT

Price Adjustment (PA)			$	**1,543.27**	**$ 1,543.27**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	660.80	
Monthly Asphalt Cement Price month project let (APL)			$	413.00	
Total Monthly Tonnage of asphalt cement (TMT)				6.227896337	

Bitum Tack Gals	gals/ton	tons
1450	232.8234	6.22789634

BITUMINOUS TACK COAT (surface treatment)

Price Adjustment (PA)				**0**	**$ -**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	660.80	
Monthly Asphalt Cement Price month project let (APL)			$	413.00	
Total Monthly Tonnage of asphalt cement (TMT)				0	

Bitum Tack	SY	Gals/SY	Gals	gals/ton	tons
Single Surf. Trmt.		0.20	0	232.8234	0
Double Surf.Trmt.		0.44	0	232.8234	0
Triple Surf. Trmt		0.71	0	232.8234	0
					0

TOTAL LIQUID AC ADJUSTMENT	$ 62,972.89

GEORGIA DEPARTMENT OF TRANSPORTATION
PRELIMINARY ROW COST ESTIMATE SUMMARY

Date: 10/20/2015 Project: 0009919
Revised: County: Newton
PI: 0009919

Description: SR 81 @ SR 162
Project Termini: SR 81 @ SR 162

Existing ROW: Varies
Parcels: 7 Required ROW: Varies

Land and Improvements	$2,343,675.00
Proximity Damage	*$0.00*
Consequential Damage	*$150,000.00*
Cost to Cures	*$125,000.00*
Trade Fixtures	*$0.00*
Improvements	*$875,000.00*
Valuation Services	$43,750.00
Legal Services	$79,725.00
Relocation	$44,000.00
Demolition	$50,000.00
Administrative	$69,000.00
TOTAL ESTIMATED COSTS	$2,630,150.00
TOTAL ESTIMATED COSTS (ROUNDED)	***$2,631,000.00***

Preparation Credits	Hours	Signature

Prepared By: Sabrone Alexander CG#: 286999 10/20/2015 (DATE)
Approved By: Sabrone Alexander CG#: 286999 10/20/2015 (DATE)

NOTE: No Market Appreciation is included in this Preliminary Cost Estimate

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE 0009919 Newton County
P.I. No. 0009919

OFFICE Tennille

DATE February 26, 2015

FROM James L. Lindsey, District Utilities Engineer

TO Albert Shelby, State Program Delivery Engineer
ATTN Daniel Chastain, Project Manager

SUBJECT **CONCEPT UTILITY COST ESTIMATE**

As requested by your office, we are furnishing you with a Concept Utility Cost estimate for each utility with facilities potentially located within the project limits.

FACILITY OWNER	NON-REIMBURSABLE	REIMBURSABLE
SNAPPING SHOALS (POWER)	$10,143.00	$22,858.00
SNAPPING SHOALS (FIBER)	$8,256.00	$10,944.00
AT&T	$137,368.00	$0.00
ATLANTA GAS LIGHT RESOURCES (GAS)	$196,850.00	$0.00
CHARTER COMMUNICATIONS	$25,299.00	$0.00
NEWTON COUNTY WATER	$338,400.00	$0.00
NEWTON COUNTY SEWER	$3,200.00	$0.00
	$719,516.00	$33,802.00

Totals

Total Non-Reimbursable Cost:	$719,516.00
Total Reimbursable Cost:	$33,802.00
Total Relocations:	$753,318.00

This estimate was compiled using information provided by the various utility owners, past estimates and the Item Mean Summary. Please be advised this is an estimate and may be revised when prior rights research is completed.

If you should have questions or need additional information, please contact Matthew Sammons at 478-552-4637.

JHS: JLL: MS

CC: Mike Bolden, State Utilities Engineer
Lee Upkins, Assistant State Utilities Engineer
Angela D. Robinson, Office of Financial Management;
Chris Dills, Area Engineer

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE P.I. No. 0009919 **OFFICE** Environmental Services

DATE November 1, 2013

Glenn Bowman

FROM Glenn Bowman, P.E., State Environmental Administrator

TO Derrick Cameron, Project Manager

SUBJECT Preliminary Mitigation Cost Estimate

As requested by your office, we are furnishing you with a preliminary cost estimate for the subject project. This project will improve the intersection of SR 81 and SR 162 in Newton County. There are three alternates being considered. After reviewing the information provided and comparing that to NWI mapping and soil mapping, none of the three alternates would impact waters of the U.S. Therefore no mitigation would be required.

DISCLAIMER: This information is based solely on a desktop review of the information available. Only after a field reconnaissance, can a more detailed and accurate cost be estimated.

If you have any questions or need additional information, please contact Lisa Westberry (404) 631-1772 of our office.

GB/HDC/lmw

cc: Jonathan Moore
General File

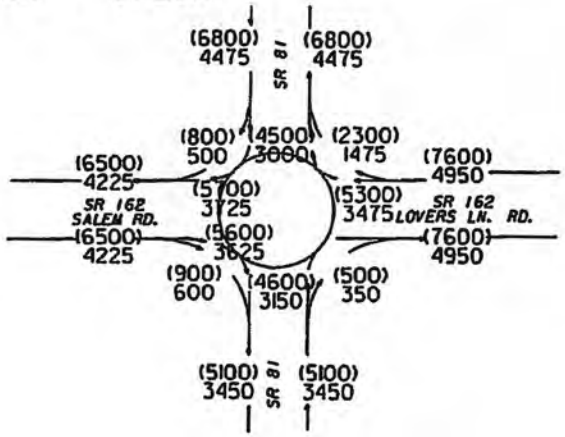
SHEET 1 OF 2

NEWTON COUNTY

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

N

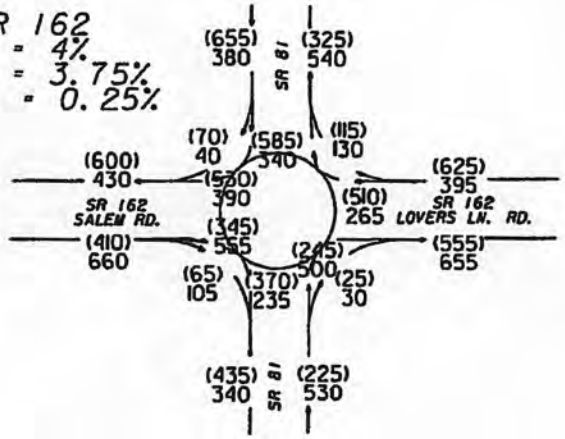
SR 162
24 HOURS T = 4.75%
S.U. = 4.5%
COMB. = 0.25%



SR 81
24 HOURS T = 8.25%
S.U. = 8%
COMB. = 0.25%

BUILD
2038 PM = (000)
2038 AM = 000

SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%



SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919
NEWTON COUNTY

AFE
03/2013

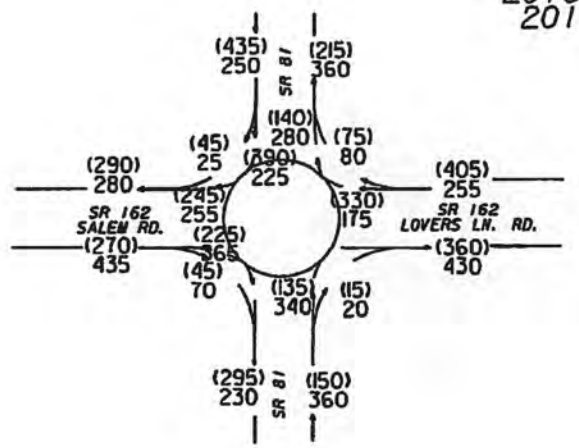
SHEET 2 OF 2

NEWTON COUNTY

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

BUILD
2018 PM = (000)
2018 AM = 000

SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%



SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919
NEWTON COUNTY

AFE
03/2013

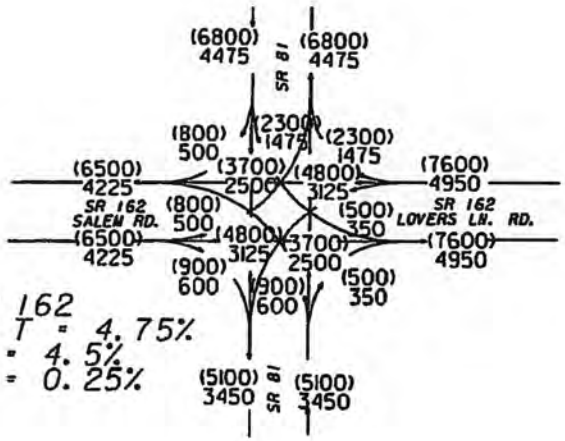
SHEET 1 OF 2

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NEWTON COUNTY

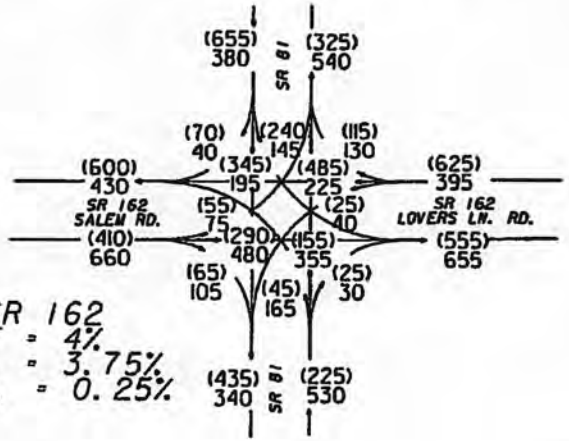
NO BUILD
2038 ADT = (000)
2018 ADT = 000

NO BUILD
2038 PM = (000)
2038 AM = 000



SR 162
24 HOURS T = 4.75%
S.U. = 4.5%
COMB. = 0.25%

SR 81
24 HOURS T = 8.25%
S.U. = 8%
COMB. = 0.25%



SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%

SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919

NEWTON COUNTY

AFE
03/20

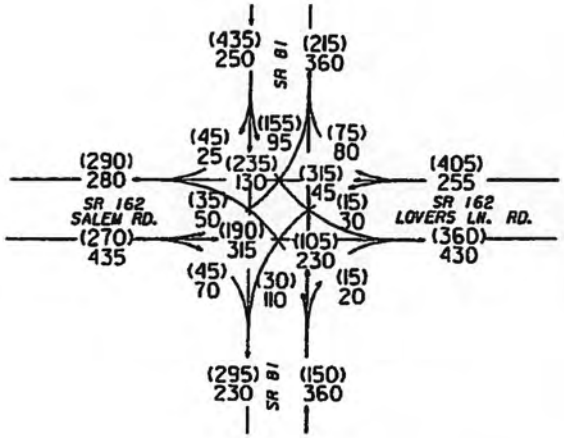
SHEET 2 OF 2

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NEWTON COUNTY

NO BUILD
2018 PM = (000)
2018 AM = 000

SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%



SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

N

SR 81 @ SR 162
P.I. 0009919
NEWTON COUNTY

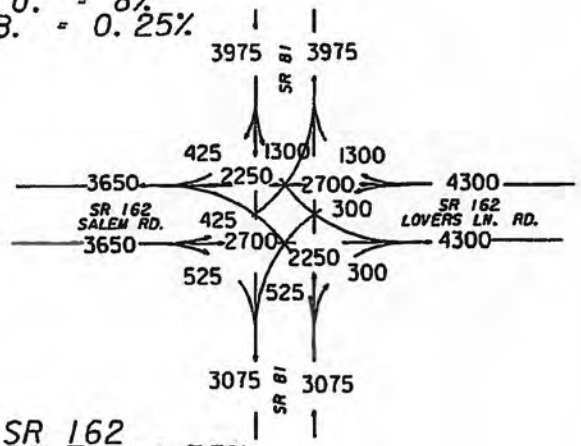
AFE
03/2013

SHEET 1 OF 1

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NEWTON COUNTY

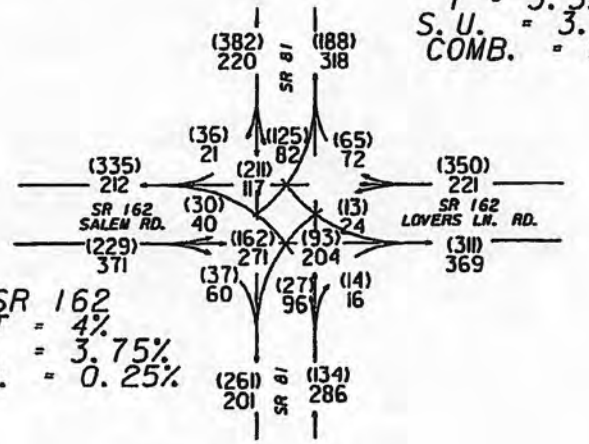
SR 81
24 HOURS T = 8.25%
S.U. = 8%
COMB. = 0.25%



SR 162
24 HOURS T = 4.75%
S.U. = 4.5%
COMB. = 0.25%

N

SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%



SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%

SR 81 @ SR 162
P.I. 0009919
NEWTON COUNTY

AFE
03/2013

AccidentNo	AgencyName	Date	Time	County	Route	IntersectingRoute	Injuries	Fatalities	MannerOfCollisior	LocationOfImpact
2233533	Newton County Sheriff's Office	9/20/2004	5:19:00 PM	NEWTON	HWY 81	0162	0	0	Angle	On Roadway
1498525	Newton County Sheriff's Office	1/20/2005	7:41:00 AM	NEWTON	HWY 81	0162	0	0	Angle	On Roadway
1538364	Newton County Sheriff's Office	4/26/2005	6:57:00 PM	NEWTON	HWY 81	0162	0	0	Rear End	On Roadway
1114628	Newton County Sheriff's Office	10/25/2005	8:29:00 PM	NEWTON	SALEM RD	HWY 81	0	0	Angle	On Roadway
1149563	Newton County Sheriff's Office	11/21/2005	4:30:00 AM	NEWTON	HWY 162 S	HWY 81	0	0	Angle	On Roadway
1164799	Newton County Sheriff's Office	1/10/2006	4:00:00 PM	NEWTON	HWY 81	SALEM RD	0	0	Angle	On Roadway
1155738	Newton County Sheriff's Office	1/12/2006	11:22:00 AM	NEWTON	HWY 81 S	SALEM RD	0	0	Angle	On Roadway
1214908	Newton County Sheriff's Office	2/1/2006	10:09:00 AM	NEWTON	SR 81	SR 162	0	0	Angle	On Roadway
1151107	Gsp Post 46 - Conyers	2/6/2006	10:22:00 AM	NEWTON	SR 81	SR 162	1	0	Angle	On Roadway
1291748	Newton County Sheriff's Office	3/6/2006	4:39:00 PM	NEWTON	SALEM RD	HWY 81	0	0	Angle	On Roadway
1284408	Newton County Sheriff's Office	4/11/2006	10:03:00 AM	NEWTON	HWY 81	SALEM RD HWY 162	0	0	Angle	On Roadway
1269248	Newton County Sheriff's Office	4/13/2006	4:45:00 PM	NEWTON	HWY 81	HWY 162	0	0	Angle	On Roadway
1363853	Newton County Sheriff's Office	7/18/2006	10:45:00 AM	NEWTON	HIGHWAY 81 SR S	HIGHWAY 162	1	0	Rear End	On Roadway
790819	Newton County Sheriff's Office	12/18/2006	5:59:00 PM	NEWTON	HIGHWAY 162	HIGHWAY 81	0	0	Head On	On Roadway
794175	Newton County Sheriff's Office	12/29/2006	6:53:00 PM	NEWTON	HWY 81	SALEM RD	0	0	Angle	On Roadway
794066	Gsp Post 46 - Conyers	2/8/2007	8:55:00 AM	NEWTON	SR 81	LOVERS LN	0	0	Angle	On Roadway
887721	Newton County Sheriff's Office	2/28/2007	6:00:00 PM	NEWTON	HWY 162	HWY 81	0	0	Angle	On Roadway
893899	Newton County Sheriff's Office	3/26/2007	7:16:00 AM	NEWTON	HWY81	HWY 162	0	0	Angle	On Roadway
848529	Gsp Post 46 - Conyers	4/3/2007	2:42:00 PM	NEWTON	SR 81	SR 162	1	0	Angle	On Roadway
958833	Newton County Sheriff's Office	5/15/2007	3:12:00 PM	NEWTON	SR 81	SR 162	0	0	Rear End	On Roadway
934157	Newton County Sheriff's Office	5/30/2007	6:20:00 PM	NEWTON	SALEM RD	HWY 81	0	0	Rear End	On Roadway
1008175	Newton County Sheriff's Office	6/6/2007	5:34:00 PM	NEWTON	HWY 81 S	HWY 162 SALEM RD	1	0	Angle	On Roadway
994958	Gsp Post 46 - Conyers	9/8/2007	9:41:00 AM	NEWTON	SALEM SR 162 RD	SR 81	2	0	Rear End	On Roadway
1064324	Newton County Sheriff's Office	9/19/2007	4:47:00 PM	NEWTON	SALEM RD	HWY81	0	0	Angle	On Roadway
518278	Newton County Sheriff's Office	11/25/2007	12:36:00 PM	NEWTON	HWY 162	HWY 81	0	0	Rear End	On Roadway
552754	Newton County Sheriff's Office	12/9/2007	4:00:00 AM	NEWTON	HWY 162	HWY 81	0	0	Not A Collision wit	Off Roadway
563830	Newton County Sheriff's Office	12/14/2007	7:41:00 AM	NEWTON	HWY 162	HWY 81	0	0	Angle	On Roadway
420792	Gsp Post 46 - Conyers	12/21/2007	6:32:00 PM	NEWTON	SR 81	BAILEY DR	0	0	Angle	On Roadway
575790	Newton County Sheriff's Office	3/1/2008	11:25:00 AM	NEWTON	LOVERS LANE RD	HWY 81	0	0	Rear End	On Roadway
572028	Newton County Sheriff's Office	3/18/2008	7:00:00 AM	NEWTON	HWY 81 S	SALEM RD	0	0	Angle	On Roadway
622286	Gsp Post 46 - Conyers	5/9/2008	1:59:00 PM	NEWTON	SR 81	SR 162	0	0	Angle	On Roadway
645490	Newton County Sheriff's Office	6/12/2008	3:36:00 PM	NEWTON	HIGHWAY 81	LOVERS LN	0	0	Angle	On Roadway
679877	Newton County Sheriff's Office	9/7/2008	6:45:00 PM	NEWTON	HWY 81	SALEM RD	0	0	Rear End	On Roadway

FirstHarmfulEvent	Light	Surface	DriverAge1	DriverAge2	DriverSafetyEquip1	DriverSafetyEquip2	VehType1	VehType2
Motor Vehicle In Motion	Daylight	Dry	33	65	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Pickup Truck
Motor Vehicle In Motion - In Other Roadway	Dark-Lighted	Dry	69	30	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Pickup Truck
Motor Vehicle In Motion	Dusk	Wet	23	17	Lap and Shoulder Belt	Lap and Shoulder Belt	Utility Passenger Vehicle	Pickup Truck
Motor Vehicle In Motion	Dark-Not Lighted	Dry	57	27	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Van
Motor Vehicle In Motion	Dark-Not Lighted	Wet	20	70	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Passenger Car
Motor Vehicle In Motion	Daylight	Dry					Pickup Truck	Pickup Truck
Motor Vehicle In Motion	Daylight	Dry					Passenger Car	Pickup Truck
Motor Vehicle In Motion - In Other Roadway	Daylight	Dry	67	42	Unknown	Unknown	Pickup Truck	Pickup Truck
Motor Vehicle In Motion	Daylight	Wet	38	35	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	24	19	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	105	105	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Pickup Truck
Motor Vehicle In Motion	Daylight	Dry	18	18	Unknown	Unknown	Passenger Car	Pickup Truck
Motor Vehicle In Motion	Daylight	Dry	41	47	Lap and Shoulder Belt	Lap and Shoulder Belt	Utility Passenger Vehicle	Pickup Truck
Motor Vehicle In Motion	Dark-Not Lighted	Dry	54	20	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Utility Passenger Vehicle
Motor Vehicle In Motion	Daylight	Dry	16	50	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	63	59	Lap and Shoulder Belt	Shoulder Belt	Pickup Truck	Utility Passenger Vehicle
Motor Vehicle In Motion	Daylight	Dry	32	106	Unknown	Unknown	Utility Passenger Vehicle	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	79	31	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Utility Passenger Vehicle
Motor Vehicle In Motion	Daylight	Dry	41	35	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	106	106	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	44	40	Lap and Shoulder Belt	Lap and Shoulder Belt	Utility Passenger Vehicle	Utility Passenger Vehicle
Motor Vehicle In Motion	Daylight	Dry	27	29	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Utility Passenger Vehicle
Motor Vehicle In Motion	Daylight	Dry	38	34	Unknown	Unknown	Van	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	44	28	Unknown	Unknown	Passenger Car	Passenger Car
Motor Vehicle In Motion	Daylight	Wet	32	59	Lap and Shoulder Belt	Lap and Shoulder Belt	Utility Passenger Vehicle	Van
Ditch	Dark-Lighted	Dry	41		Lap and Shoulder Belt		Passenger Car	
Motor Vehicle In Motion	Daylight	Dry	50	64	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Passenger Car
Motor Vehicle In Motion	Dark-Lighted	Dry	52	37	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Bus
Motor Vehicle In Motion	Daylight	Dry	51	42	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Passenger Car
Motor Vehicle In Motion	Dark-Lighted	Dry	36	50	Lap and Shoulder Belt	Lap and Shoulder Belt	Passenger Car	Pickup Truck
Motor Vehicle In Motion	Daylight	Dry	31	51	Lap and Shoulder Belt	Lap and Shoulder Belt	Tractor/Trailer	Vehicle With Trailer
Motor Vehicle In Motion	Daylight	Dry	54	30	Lap and Shoulder Belt	Lap and Shoulder Belt	Panel Truck	Passenger Car
Motor Vehicle In Motion	Daylight	Dry	52	29	Lap and Shoulder Belt	Lap and Shoulder Belt	Pickup Truck	Pickup Truck

DirVeh1	DirVeh2	MnvrVeh1	MnvrVeh2	LatDecimal	LongDecimal	U1Factors	U2Factors
East	Northeast	Straight	Straight	33.556528	-83.921895	Failed to Yield	No Contributing Factors
Northeast	Southeast	Straight	Straight	33.556528	-83.921895	Other	Other
Northeast	Northeast	Straight	Stopped	33.556528	-83.921895	Inattentive	No Contributing Factors
North	North	Entering/Leaving Driveway	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
East	Southeast	Straight	Straight	33.554339	-83.920815	Wrong Side of Road	No Contributing Factors
Northeast	Northeast	Turning Left	Straight	33.55641	-83.922217	Failed to Yield	No Contributing Factors
North	Southeast	Turning Left	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
Northeast	Southeast	Straight	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
Northeast	Southeast	Straight	Straight	33.556147	-83.922976	Disregard Stop Sign/Signal	Disregard Stop Sign/Signal
North	North	Entering/Leaving Parking	Straight	33.556026	-83.921637	Misjudged Clearance	No Contributing Factors
North	Southeast	Entering/Leaving Parking	Straight	33.556098	-83.923122	Failed to Yield	No Contributing Factors
Southeast	Northeast	Turning Right	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
Northeast	Northeast	Stopped	Stopped	33.556147	-83.922976	Misjudged Clearance	No Contributing Factors
Southeast	Northeast	Straight	Turning Left	-1	-1	Failed to Yield	No Contributing Factors
North	Northeast	Turning Left	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
Southeast	North	Straight	Straight	-1	-1	Disregard Stop Sign/Signal	No Contributing Factors
North	Southeast	Turning Left	Turning Left	33.555469	-83.921598	Failed to Yield	Other
Northeast	East	Straight	Straight	33.556147	-83.922976	Failed to Yield	Failed to Yield
North	East	Straight	Straight	33.556147	-83.922976	Disregard Stop Sign/Signal	No Contributing Factors
Northeast	Northeast	Straight	Stopped	33.556147	-83.922976	Following too Close	No Contributing Factors
East	East	Straight	Stopped	33.5552	-83.921592	Following too Close	No Contributing Factors
Southeast	North	Straight	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
Northeast	Northeast	Straight	Stopped	33.556147	-83.922976	D.U.I	No Contributing Factors
North	North	Turning Left	Straight	33.555606	-83.921597	Failed to Yield	No Contributing Factors
North	Southeast	Straight	Stopped	33.556147	-83.922976	Following too Close	No Contributing Factors
Northeast		Straight		33.5552	-83.921592	Driver Condition	
Southeast	Northeast	Straight	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
North	Southeast	Straight	Straight	33.555952	-83.923559	D.U.I	No Contributing Factors
North	North	Straight	Stopped	33.555469	-83.921598	Following too Close	No Contributing Factors
Southeast	Northeast	Straight	Straight	33.556147	-83.922976	Failed to Yield	No Contributing Factors
North	East	Straight	Straight	33.556147	-83.922976	Other	Other
Northeast	Southeast	Straight	Straight	33.556147	-83.922976	Disregard Stop Sign/Signal	No Contributing Factors
North	North	Straight	Stopped	33.556147	-83.922976	Following too Close	No Contributing Factors

Georgia Department of Transportation

Roundabout Feasibility Study

June 10, 2015

PROJECT:	**P.I. 0009919**
LOCATION:	**Intersection of State Route 81 at State Route 162**
COUNTY:	**Newton County**
CITY:	***N/A***

Project Background and Site Conditions

The purpose of this study is to evaluate alternatives that could be implemented that would enhance safety and improve on operations & LOS at the intersection of State Route 81 and State Route 162. The intersection is currently operating as an All-Way Stop controlled intersection. The following alternatives will be analyzed in this study to determine if the operations of the intersection can be improved upon: Traffic Signal, Single-Lane Roundabout, Dual Lane Roundabout, and No-Build.

The intersection of State Route 81 and State Route 162 is a cross road type intersection located in rural Newton County. This intersection is located in a portion of the County consisting of both sporadic single family detached homes and residential subdivisions; however, the area around the intersection is built up with commercial establishments. A *BP* gas station is located in the western quadrant, a *Citgo* gas station is located in the southern quadrant, a *Dollar General* discount retail store is located in the eastern quadrant, and a lawn care/nursery supply yard is located on the northern quadrant of the intersection. A Newton County School's Headstart facility is located just south of this intersection on State Route 162 with a main driveway access located 260'+/- from the intersection.

State Route 81 is classified as a Urban Principal Arterial and State Route 162 is classified as Urban Minor Arterial at this location. Both routes consist of two lane roadways with one lane of travel in each direction. All moments on the northwest approach of State Route 162 and both approaches of State Route 81 are required to stop at the intersection. The southeast approach of State Route 162 consists of a stop condition for the left and thru movements and a yield condition for the right turn movements. The posted speed limit for State Route 81 at this location is 55 MPH and the posted speed limit for State Route 162 at this location is 45 MPH.

Safety Assessment

The Georgia Electronic Accident Reporting System (GEARS) was searched for incidents that may have occurred at the intersection during the time period of January 1, 2009 through December 31, 2013. Six crashes were found to have occurred at the intersection during this 5 year period. None of the crashes involved any reported injuries or fatalities. A breakdown of the crashes that occurred at the intersection are shown in Table 1.

Year	Total Crashes	Angle	Rear End	Sideswipe	Not a collision with a motor vehicle	Property Damage Only	Injury	Fatal
2009	1	0	1	0	0	1	0	0
2010	1	0	0	1	0	1	0	0
2011	0	0	0	0	0	0	0	0
2012	2	0	0	1	1	2	0	0
2013	2	1	1	0	0	2	0	0

Table 1 – Intersection Crash Data 2009 through 2013

Operational Analysis

Traffic data for Base Year 2018 and Design Year 2038 was obtained from GDOT Office of Planning and these volumes were used to analyze several alternatives that could potentially improve on operations and LOS at this intersection. Copies of the traffic data used are attached in the Appendix A of this study. A single lane roundabout design, a dual lane roundabout design, and a signalized intersection design were developed as alternatives to analyze in this study.

ALTERNATIVE 1 - NO –BUILD – ALL WAY STOP

An operational analysis was performed on the existing intersection for the all-way stop condition using HCS+. The analysis was performed using both the 2018 and 2038 AM and PM peak hour volumes. Those findings are outlined in Tables 2 and 3 below and the HCS+ results can be found in Appendix B. The 2018 volumes indicate that the intersection would run at LOS F/E with service deteriorating to a LOS F for both AM and PM peaks by 2038.

2018 - Base Year - All Way Stop					
Analysis Tool	Approach	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
HSC+	Southeast/(WB)	18.99	C	30.82	D
	Northwest/(EB)	116.86	F	22.51	C
	Northeast/(SB)	24.5	C	65.64	F
	Southwest/(NB)	47.81	E	15.61	C
	Intersection	60.66	F	39.29	E

Table 2 – 2018 Base Year – All Way Stop

2038 - Base Year - All Way Stop					
Analysis Tool	Approach	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
HSC+	Southeast/(WB)	48.80	E	795.46	F
	Northwest/(EB)	1633	F	268.53	F
	Northeast/(SB)	139.37	F	1383	F
	Southwest/(NB)	1053	F	31.09	D
	Intersection	885	F	750.82	F

Table 3 - 2038 Base Year – All Way Stop

ALTERNATIVE 2 – SINGLE LANE ROUNDABOUT

A single lane roundabout, as shown in Figure 1, was analyzed using SIDRA 5.1 with SIDRA standard procedure, the GDOT Roundabout Analysis Tool, and HCS 2010 software. The analysis was performed using both the 2018 and 2038 AM and PM peak hour volumes. The 2018 Base Year volumes indicate that the intersection would efficiently operate, but by the 2038 Deign Year the intersection would experience high rates of delay and have high V/C ratios. The findings found in the models are outlined in Tables 4 and 5. The model output results can be found in Appendix C.

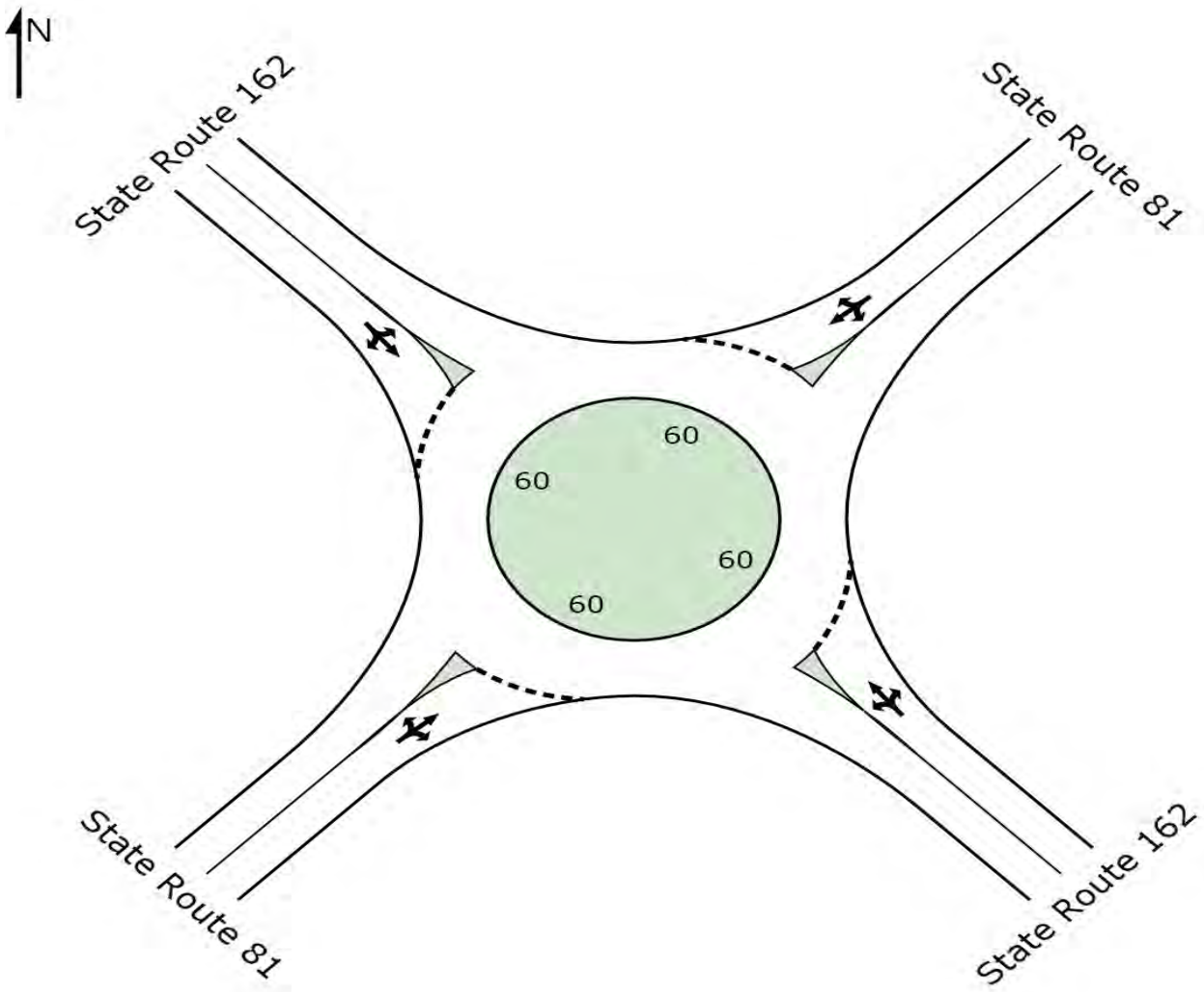


Figure 1: Alternative 2 – Single Lane Roundabout

2018 - Base Year - Single Lane Roundabout														
AM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.40	10.50	B	0.58	13.30	B	0.34	8.70	A	0.61	16.80	C	12.81	B
Sidra EF=1.1	0.22	10.50	B	0.51	10.00	A	0.28	10.20	B	0.55	14.60	B	11.60	B
Sidra EF=1.2	0.42	11.80	B	0.58	11.40	B	0.35	11.70	B	0.63	17.50	B	13.20	B
GDOT Roundabout Analysis Tool	0.32	7.00	A	0.48	9.00	A	0.29	7.00	A	0.48	11.00	B		
PM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.49	10.30	B	0.43	11.20	B	0.65	17.20	C	0.23	7.80	A	12.57	B
Sidra EF=1.1	0.43	8.50	A	0.40	11.10	B	0.59	14.00	B	0.21	10.70	B	0.59	B
Sidra EF=1.2	0.47	8.80	A	0.46	12.50	B	0.67	16.60	B	0.24	11.30	B	12.60	B
GDOT Roundabout Analysis Tool	0.42	8.00	A	0.34	8.00	A	0.53	11.00	B	0.19	6.00	A		

Table 4 – 2018 Base Year – Single Lane Roundabout

2038 - Base Year - Single Lane Roundabout														
AM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.77	29.00	D	1.01	61.60	F	0.62	16.80	C	1.22	140.60	F	68.46	F
Sidra EF=1.1	0.67	17.00	B	0.92	27.40	C	0.55	14.10	B	1.23	138.30	F	53.50	D
Sidra EF=1.2	0.71	18.80	B	1.04	55.60	E	0.61	16.10	B	1.37	200.20	F	80.80	F
GDOT Roundabout Analysis Tool	0.60	15.00	B	0.82	23.00	C	0.49	11.00	B	0.91	41.00	E		
PM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.83	26.50	D	0.82	33.70	D	1.22	139.00	F	0.44	13.40	B	65.03	F
Sidra EF=1.1	0.73	12.60	B	0.73	19.60	B	1.18	111.60	F	0.39	12.90	B	48.00	D
Sidra EF=1.2	0.81	16.20	B	0.75	20.10	C	1.38	199.70	F	0.43	14.10	B	79.60	E
GDOT Roundabout Analysis Tool	0.69	15.00	B	0.63	16.00	C	0.95	45.00	E	0.34	9.00	A		

Table 5 -2038 Design Year – Single Lane Roundabout

ALTERNATIVE 3 – SINGLE LANE ROUNDABOUT WITH RIGHT TURN BYPASS LANES

A single lane roundabout with right turn bypass lanes, as shown in Figure 1, was analyzed using SIDRA 5.1 with SIDRA standard procedure, the GDOT Roundabout Analysis Tool, and HCS 2010 software. The analysis was performed using both the 2018 and 2038 AM and PM peak hour volumes. The 2018 Base Year volumes indicate that the intersection would efficiently operate, and the 2038 Deign Year volumes indicate the intersection would operate within an acceptable amount of delay and LOS. A right turn bypass lane was not added to the southern quadrant of the intersection due to the lower right turn traffic volumes from the SW approach and R/W constraints. The findings found in the models are outlined in Tables 6 and 7. The model output results can be found in Appendix D.

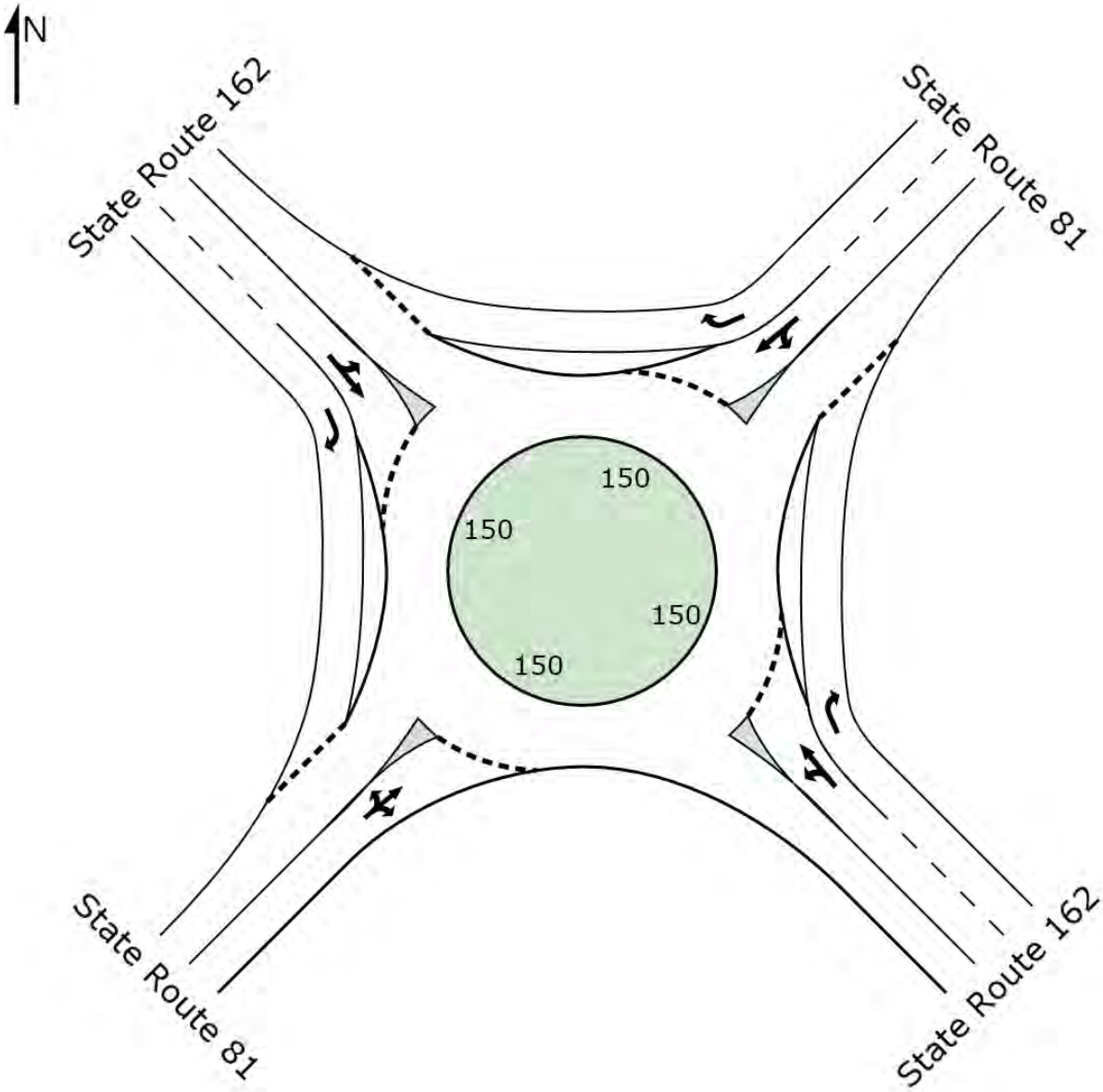


Figure 2: Alternative 3 – Single Lane Roundabout + Turn Lanes

2018 - Base Year - Single Lane Roundabout + Turn Lanes														
AM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast/(SB)			Southwest/(NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.27	8.4	A	0.49	11.0	B	0.31	8.2	A	0.61	16.8	C	10.89	B
Sidra EF=1.1	0.161	6.7	A	0.295	6	A	0.184	8.3	A	0.438	10	B	7.7	A
Sidra EF=1.2	0.183	6.9	A	0.329	6.3	A	0.207	8.6	A	0.5	11.6	B	8.3	A
GDOT Roundabout Analysis Tool	0.22	6	A	0.41	8	A	0.26	6	A	0.48	11	B		
PM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.4	8.7	A	0.36	9.9	A	0.59	14.7	B	0.23	7.8	A	10.17	A
Sidra EF=1.1	0.248	6	A	0.209	6.8	A	0.338	8.8	A	0.169	7.9	A	7.3	A
Sidra EF=1.2	0.273	5.1	A	0.236	7.1	A	0.381	9.1	B	0.191	8.3	B	7.3	A
GDOT Roundabout Analysis Tool	0.34	7	A	0.29	7	A	0.48	10	A	0.19	6	A		

Table 6 – 2018 Base Year – Single Lane Roundabout + Right Turn Lanes

2038 - Base Year - Single Lane Roundabout + Turn Lanes														
AM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.52	15.8	B	0.85	31.5	D	0.55	14.6	B	1.22	140.6	F	53.32	F
Sidra EF=1.1	0.318	9.3	A	0.504	7	A	0.318	9.3	A	0.913	36.5	D	15.8	B
Sidra EF=1.2	0.356	9.6	A	0.567	8	A	0.356	9.6	A	1.067	75.6	E	27.1	C
GDOT Roundabout Analysis Tool	0.4	10	A	0.69	16	C	0.44	10	A	0.91	41	E		
PM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.68	16.7	B	0.69	23.4	C	1.09	91.5	F	0.44	13.4	B	39.02	E
Sidra EF=1.1	0.145	5.6	A	0.42	8.4	A	0.616	12.5	B	0.32	9.9	A	9.1	A
Sidra EF=1.2	0.437	5.4	A	0.452	8.6	A	0.659	13.4	B	0.346	10.1	B	7.8	A
GDOT Roundabout Analysis Tool	0.57	11	B	0.53	13	B	0.85	29	D	0.34	9	A		

Table 7 – 2038 Base Year – Single Lane Roundabout + Right Turn Lanes

ALTERNATIVE 4 – PARTIAL MULTILANE ROUNDABOUT

A partial multilane roundabout consisting of 2 approach lanes on State Route 81, single approach lanes on State Route 162, a combination of 1 to 2 circulating lanes within the circle, and single lanes that exit the roundabout on each approach as shown in Figure 2 was analyzed using SIDRA 5.1 with SIDRA standard procedure, the GDOT Roundabout Analysis Tool, and HCS 2010 software. The analysis was performed using both the 2018 and 2038 AM and PM peak hour volumes. Both the 2018 and 2038 volumes indicated that the intersection would efficiently operate and run with minimal delays. These findings are outlined in Tables 8 and 9 and the model output results can be found in Appendix E. Multiple lanes were considered on the other approaches but were ruled out since the partial configuration operates sufficiently through the Design year and adding additional lanes will create more conflict points around the intersection.

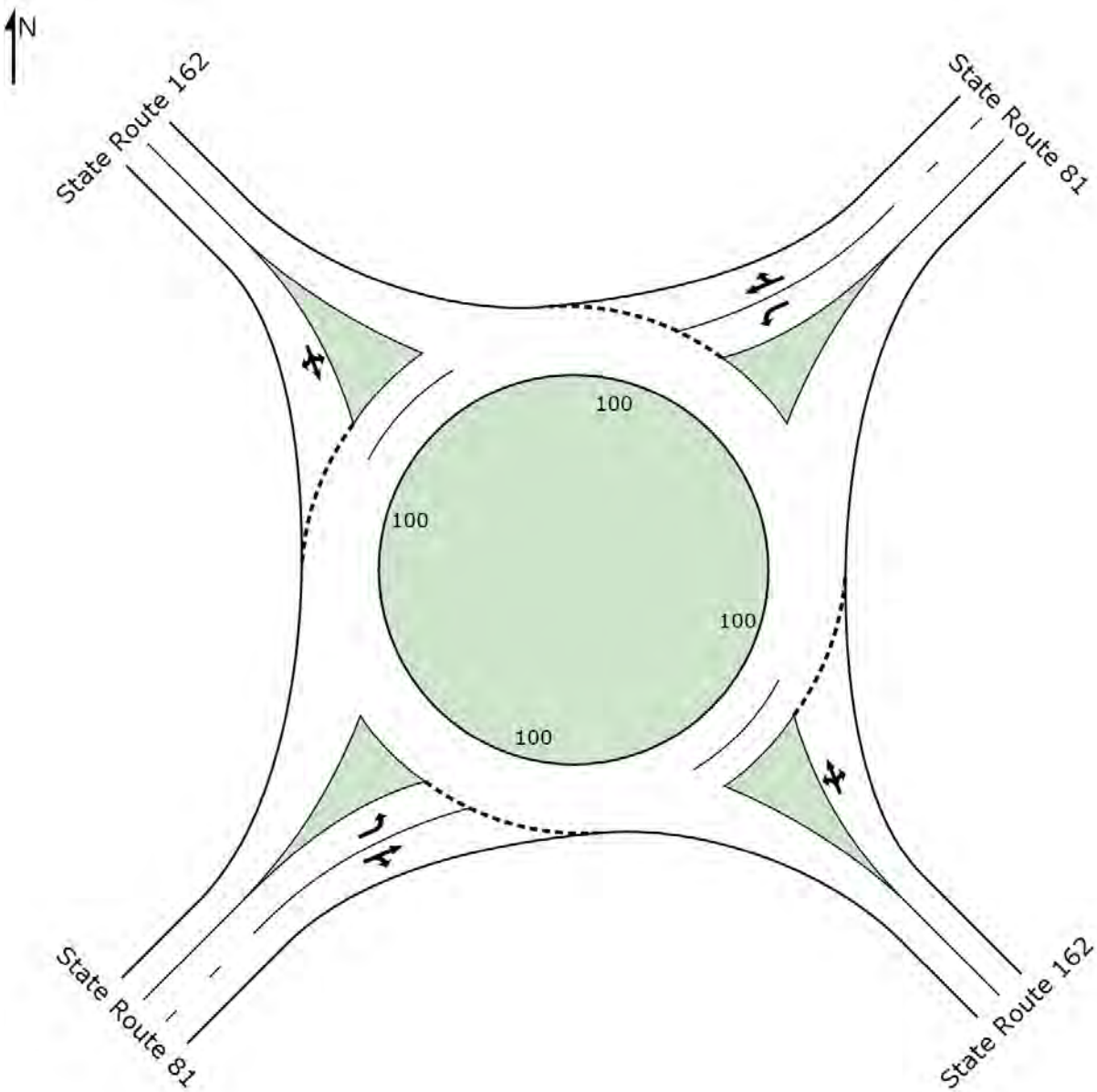


Figure 3: Alternative 4 – Partial Multi Lane Roundabout

2018 - Base Year - Partial Dual Lane Roundabout														
AM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast/(SB)			Southwest/(NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.35	8.7	A	0.58	13.3	B	0.26	6.4	A	0.33	8.8	A	9.62	A
Sidra EF=1.1	0.437	7	A	0.377	8.9	A	0.268	10	B	0.116	8.8	A	8.6	A
Sidra EF=1.2	0.244	9.8	A	0.575	9.4	A	0.142	9.1	A	0.298	10.8	B	9.8	A
GDOT Roundabout Analysis Tool	0.24	5.2	A	0.39	6.8	A	0.14	4.2	A	0.17	5.2	A		
PM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.49	10.3	A	0.36	9.9	B	0.52	11.7	B	0.18	6.4	A	9.7	A
Sidra EF=1.1	0.437	7	A	0.377	8.9	A	0.268	10	B	0.116	8.8	A	8.6	A
Sidra EF=1.2	0.482	7.3	A	0.429	9.8	A	0.302	10.4	B	0.131	9.2	A	9.1	A
GDOT Roundabout Analysis Tool	0.33	5.7	A	0.28	6.2	A	0.28	5.9	A	0.12	4.4	A		

Table 8-2018 Base Year – Dual Lane Roundabout

2038 - Base Year - Partial Dual Lane Roundabout														
AM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.77	29	D	1.01	61.64	F	0.48	11.2	B	0.91	42.1	D	36.19	E
Sidra EF=1.1	0.675	13.5	B	0.879	17.1	C	0.241	10.6	B	0.571	14.9	B	14.5	B
Sidra EF=1.2	0.777	17.5	B	0.991	33.3	C	0.275	11.0	B	0.661	18	B	21.6	C
GDOT Roundabout Analysis Tool	0.5	10.8	B	0.67	13.2	B	0.25	5.9	A	0.54	12.7	B		
PM Peak														
Analysis Tool	Southeast (WB)			Northwest (EB)			Northeast (SB)			Southwest (NB)			Intersection	
	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	V/C	Delay (s/veh)	LOS	Delay (s/veh)	LOS
HCS2010	0.83	26.5	D	0.82	33.7	D	0.91	39	D	0.32	9.3	A	27.5	D
Sidra EF=1.1	0.733	10.2	B	0.697	13.7	B	0.502	12.5	B	0.214	10.5	B	11.8	B
Sidra EF=1.2	0.813	13	B	0.809	18.2	B	0.586	14.3	B	0.247	11.2	B	14.4	B
GDOT Roundabout Analysis Tool	0.56	9.4	A	0.4	9	A	0.5	10.4	B	0.25	6.3	A		

Table 9 - 2038 Design Year – Dual Lane Roundabout

ALTERNATIVE 5 – TRAFFIC SIGNAL

A Traffic Signal Warrant Evaluation was performed for this intersection using 2018 Base year traffic volumes provided. The intersection was found to meet Warrant 1 – Eight Hour Vehicular Volumes, Warrant 2 Four Hour Volumes, and Warrant 3 Peak Hour Volume as described in part 4 of the Manual on Uniform Traffic Control Devices (2009 edition). An operational analysis was then performed for a proposed stop and go traffic signal as depicted in Figure 4 using HCS 2010. The analysis was performed using both the 2018 and 2038 AM and PM peak hour volumes. Both 2018 and 2038 traffic volumes indicated that the intersection should function at a LOS B for both AM and PM peak hours. Those findings are outlined in Tables 10 and 11 below and the HCS 2010 results can be found in Appendix F.

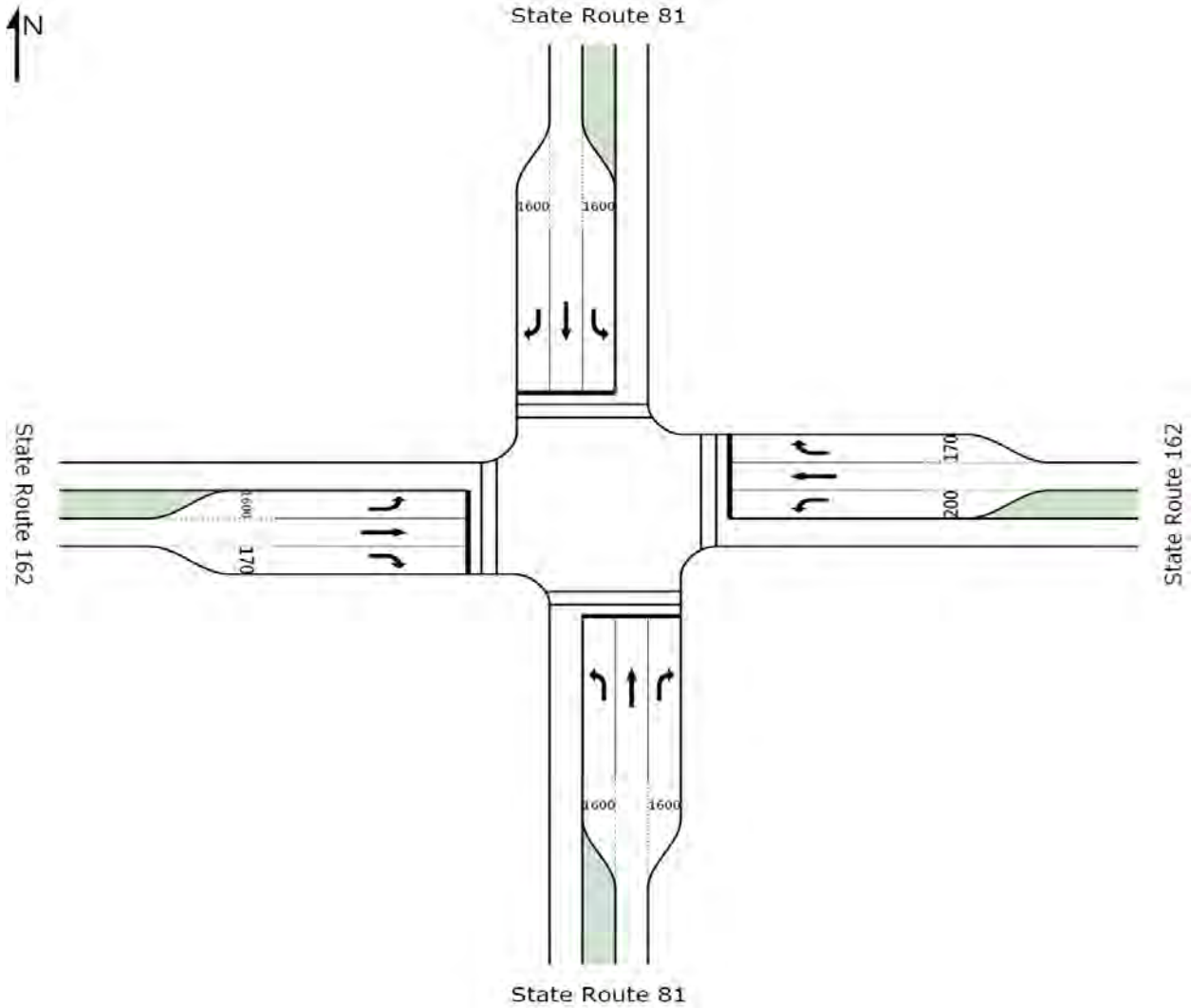


Figure 4: Alternative 5 – Traffic Signal

2018 - Base Year - Traffic Signal					
Analysis Tool	Approach	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
HSC	Southeast/(WB)	6.5	A	5.4	A
	Northwest/(EB)	5.9	A	5.7	A
	Northeast/(SB)	20.5	A	20.6	C
	Southwest/(NB)	20.9	A	22.2	C
	Intersection	**13**	**A**	**1.1**	**B**

Table 10 - 2018 Base Year – Stop and Go Traffic Signal

2038 - Base Year - Traffic Signal					
Analysis Tool	Approach	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
HSC	Southeast/(WB)	12.7	B	9.7	A
	Northwest/(EB)	10.9	B	10.6	B
	Northeast/(SB)	22.8	B	23.4	C
	Southwest/(NB)	24.1	B	26.3	C
	Intersection	**17.3**	**B**	**17.3**	**B**

Table 11 - 2038 Design Year – Stop and Go Traffic Signal

Shown below in Table 12 is a comparison of LOS for each of the alternatives.

LOS				
Intersection Type	2018 AM	2018 PM	2038 AM	2038 PM
All Way Stop	F	E	F	F
Single Lane Roundabout	B	B	F	E
Single Lane Roundabout + Turn Lanes	A	A	C	A
Partial Dual Lane Roundabout	A	A	C	B
Stop and Go Traffic Signal	A	B	B	B

Table 12 - LOS

Cost Comparison

A cost comparison for each alternative analyzed in the study is shown below in Table 12.

Alternate Number	Alternate	Construction	Right of Way	Utility (reimbursable)	Total
1	All Way Stop	$ 0	$ 0	$ 0	$ 0
2	Single Lane Roundabout	$ 511,022.06	$ 2,828,000.00	$ 33,802.00	$ 3,373,824
3	Single Lane Roundabout + Turn Lanes	$744,753.59	$ 2,828,000.00	$ 33,802.00	$ 3,606,555
4	Partial Dual Lane Roundabout	$ 663,071.55	$ 2,829,000.00	$ 33,802.00	$ 3,525,874
5	Stop and Go Traffic Signal	$ 868,436.23	$ 3,097,000.00	$ 33,000.00	$ 3,998,436

Table 13 – Project Alternative Costs

Alternate Selection

A summary of the findings outlined in this study are shown below:

- **An all way stop intersection is currently in operation. It will service the intersection at a LOS F with significant amounts of delay occurring on and before the 2038 Design Year.**
- **A single lane roundabout would service the intersection at a LOS B at the 2018 Base Year and falls to a LOS E/F by the Design year 2038.**
- **A single lane roundabout with right turn bypass lanes would operate the intersection at a LOS A in the Base Year 2018 and at a LOS C/A in the Design Year 2038.**
- **A partial dual lane roundabout would operate the intersection at a LOS A in the Base Year 2018 and at a LOS C/B in the Design Year 2038.**
- **A signalized intersection would operate the intersection at a LOS B in both the 2018 Base Year and the 2038 Design Year.**
- **Due to the skewed configuration of the intersection it will be difficult to construct the right turn bypass lanes to accommodate for large truck traffic without making significant impacts to adjacent properties for required R/W and access restrictions.**
- **Based on projected traffic volumes a single lane roundabout could be constructed in the Base Year 2018 utilizing a partial dual lane roundabout footprint. This will improve on over safety at the intersection but minimized conflicts points in and around the roundabout at build year. As traffic volumes increase then the intersection could be easily converted to a multilane facility. This is predicted to occur 10-15 years after Base Year.**

RECOMMENDATIONS

1) **It is recommended that the intersection be constructed at this time to function as a single lane roundabout.**
2) **It is recommended that a single lane roundabout be constructed utilizing a partial dual lane roundabout footprint in order to easily facilitate the conversation to accommodate for future additional capacity. The areas for the additional lanes can be blocked out for future use.**
3) **See attached proposed Single Lane Roundabout (Intermediate Design) and attached future conversion to partial dual roundabout (Final Design) on attached pages.**

SR 81 AT SR 162

NEWTON COUNTY, GEORGIA

Appendix A

PI 0009919 Traffic Volume Project.....Al-AS

Appendix B

HCS 2018 AM Peak All Way Stop Analysis B1-B2
HCS 2018 PM Peak All Way Stop Analysis B3-B4
HCS 2038 AM Peak All Way Stop Analysis B5-B6
HCS 2038 PM Peak All Way Stop Analysis B7-B8

Appendix C

HCS 2018 AM Peak Hour Single Lane Roundabout Analysis Cl-C2
HCS 2018 PM Peak Hour Single Lane Roundabout Analysis C3-C4
SIDRA 2018 AM Peak Hour Single Lane Roundabout Analysis C5-C6
SIDRA 2018 PM Peak Hour Single Lane Roundabout Analysis C7-C8
HCS 2038 AM Peak Hour Single Lane Roundabout Analysis C9-C10
HCS 2038 PM Peak Hour Single Lane Roundabout Analysis C11-C12
SIDRA 2038 AM Peak Hour Single Lane Roundabout Analysis C13-C14
SIDRA 2038 PM Peak Hour Single Lane Roundabout Analysis C15-C16
GDOT Roundabout Analysis Tool 2018 AM Peak C17-C19
GDOT Roundabout Analysis Tool 2018 PM Peak C20-C22
GDOT Roundabout Analysis Tool 2038 AM Peak C23-C25
GDOT Roundabout Analysis Tool 2038 PM Peak C26-C28

Appendix D

HCS 2018 AM Peak Hour Single Lane + Turn Lane Dl-D2
HCS 2018 PM Peak Hour Single Lane + Turn Lane D3-D4
SIDRA 2018 AM Peak Hour Single Lane + Turn Lane D5-D6
SIDRA 2018 PM Peak Hour Single Lane + Turn Lane D7-D8
HCS 2038 AM Peak Hour Single + Turn Lane D9-D10
HCS 2038 PM Peak Hour Single + Turn Lane D11-D12
SIDRA 2038 AM Peak Hour Single + Turn Lane.....D13-D14
SIDRA 2038 PM Peak Hour Single + Turn Lane.....D15-D16
GDOT Roundabout Analysis Tool 2018 AM Peak D17-D19
GDOT Roundabout Analysis Tool 2018 PM Peak D20-D22
GDOT Roundabout Analysis Tool 2038 AM Peak D23-D25
GDOT Roundabout Analysis Tool 2038 PM Peak D26-D28

Appendix E

HCS 2018 AM Peak Hour Partial Dual Lane Roundabout Analysis El-E2
HCS 2018 PM Peak Hour Partial Dual Lane Roundabout Analysis..... E3-E4
SIDRA 2018 AM Peak Hour Partial Dual Lane Roundabout Analysis E5-E6
SIDRA 2018 PM Peak Hour Partial Dual Lane Roundabout Analysis E7-E8
HCS 2038 AM Peak Hour Partial Dual Lane Roundabout Analysis E9-E10
HCS 2038 PM Peak Hour Partial Dual Lane Roundabout Analysis E11-E12
SIDRA 2038 AM Peak Hour Partial Dual Lane Roundabout Analysis... E13-E14
SIDRA 2038 PM Peak Hour Partial Dual Lane Roundabout Analysis... E15-E16
GDOT Roundabout Analysis Tool 2018 AM Peak E17-E19
GDOT Roundabout Analysis Tool 2018 PM Peak E20-E23
GDOT Roundabout Analysis Tool 2038 AM Peak E24-E26
GDOT Roundabout Analysis Tool 2038 PM Peak E27-E29

Appendix F

Traffic Signal Warrant Analysis Fl-F2
HCS 2018 AM Peak Hour Analysis F3
HCS 2018 PM Peak Hour Analysis F4
HCS 2038 AM Peak Hour Analysis F5
HCS 2038 PM Peak Hour Analysis F6

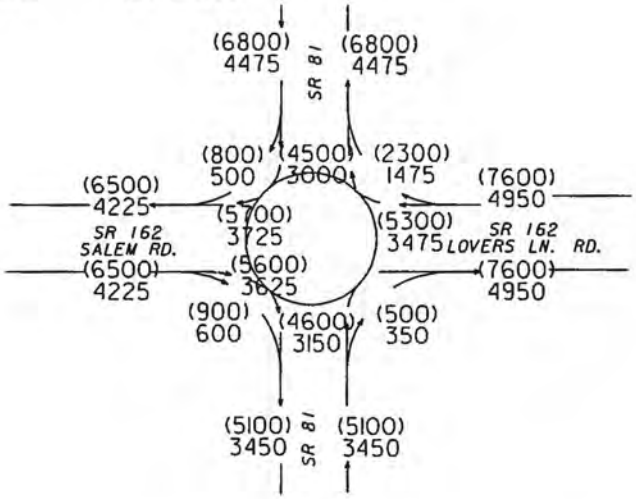
SHEET 1 OF 2

NEWTON COUNTY

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

N

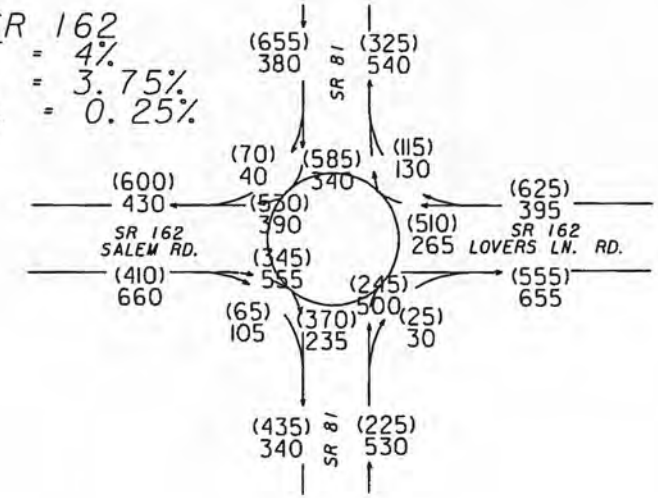
SR 162
24 HOURS T = 4.75%
S.U. = 4.5%
COMB. = 0.25%



SR 81
24 HOURS T = 8.25%
S.U. = 8%
COMB. = 0.25%

BUILD
2038 PM = (000)
2038 AM = 000

SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%



SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919

NEWTON COUNTY

AFE
03/2013

A1

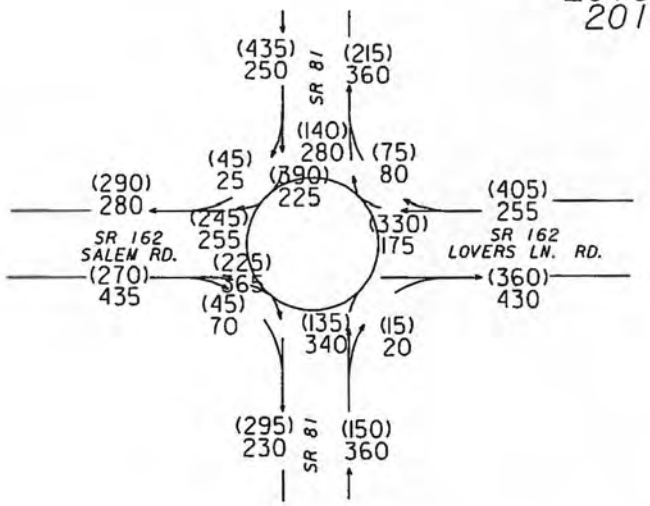
SHEET 2 OF 2

NEWTON COUNTY

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

BUILD
2018 PM = (000)
2018 AM = 000

SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%



SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919

NEWTON COUNTY

AFE
03/2013

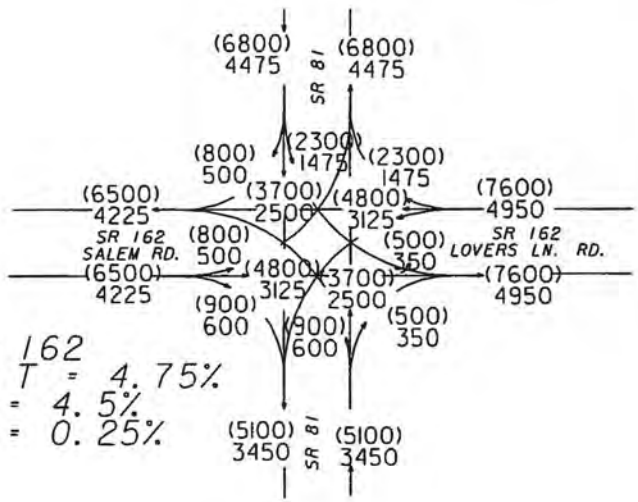
A2

SHEET 1 OF 2

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NEWTON COUNTY

NO BUILD
2038 ADT = (000)
2018 ADT = 000

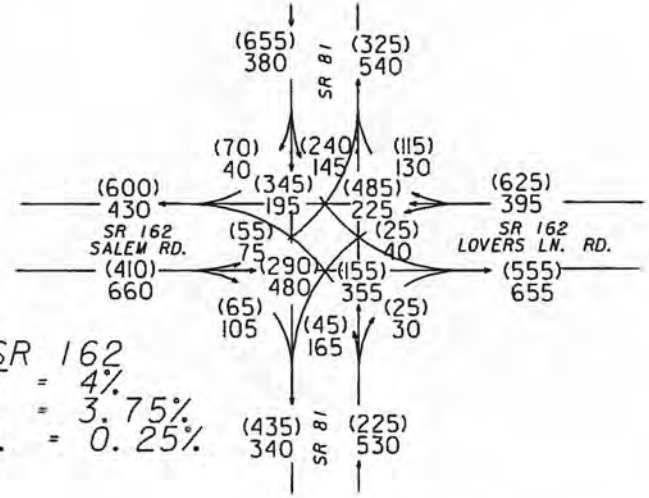


SR 162
24 HOURS T = 4.75%
S.U. = 4.5%
COMB. = 0.25%

SR 81
24 HOURS T = 8.25%
S.U. = 8%
COMB. = 0.25%

N

NO BUILD
2038 PM = (000)
2038 AM = 000



SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%

SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919

NEWTON COUNTY

AFE
03/201

A3

SHEET 2 OF 2

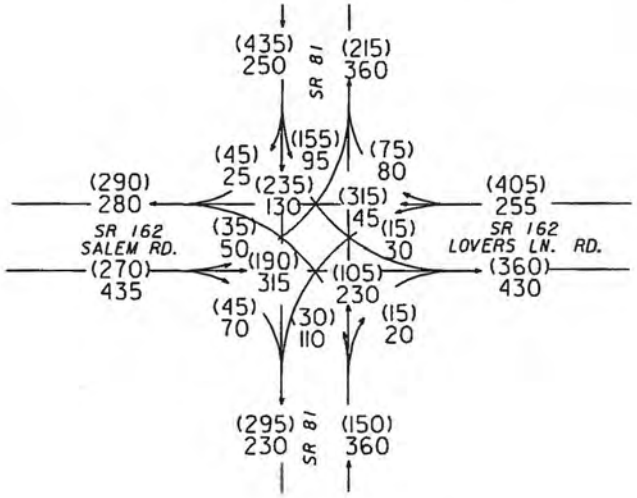
GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NEWTON COUNTY

N

NO BUILD
2018 PM = (000)
2018 AM = 000

SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%



SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%

SR 81 @ SR 162
P.I. 0009919

NEWTON COUNTY

AFE
03/2013

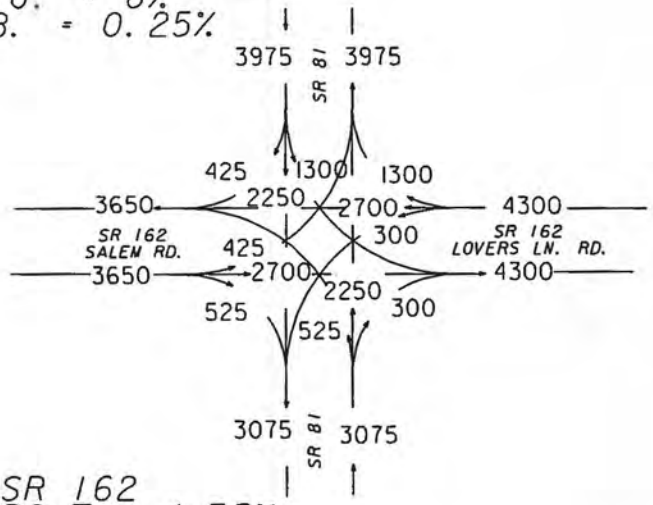
A4

SHEET 1 OF 1

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

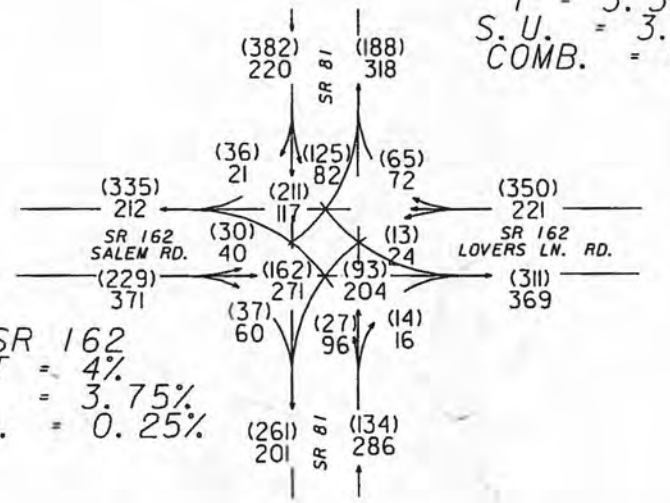
NEWTON COUNTY

SR 81
24 HOURS T = 8.25%
S.U. = 8%
COMB. = 0.25%



SR 162
24 HOURS T = 4.75%
S.U. = 4.5%
COMB. = 0.25%

SR 81
T = 3.5%
S.U. = 3.5%
COMB. = 0%



SR 162
T = 4%
S.U. = 3.75%
COMB. = 0.25%

SR 81 @ SR 162
P.I. 0009919

NEWTON COUNTY

AFE
03/2013

A5

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: Todd Price
Agency/Co.: GDOT
Date Performed:
Analysis Time Period: AM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2 - Newton County
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 - All Way Stop
East/West Street: SR 162
North/South Street: Sr 81

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	50	315	70	30	145	80	110	230	20	95	130	25
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LT	R	LTR		LTR	
PHF	0.92		0.92	1.00	0.92		0.92	
Flow Rate	472		189	80	389		271	
% Heavy Veh	0		0	0	0		0	
No. Lanes	1		2		1		1	
Opposing-Lanes	2		1		1		1	
Conflicting-lanes	1		1		2		2	
Geometry group	4a		5		2		2	

Duration, T 1.00 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	472		189	80	389		271	
Left-Turn	54		32	0	119		103	
Right-Turn	76		0	80	21		27	
Prop. Left-Turns	0.1		0.2	0.0	0.3		0.4	
Prop. Right-Turns	0.2		0.0	1.0	0.1		0.1	
Prop. Heavy Vehicle	0.0		0.0	0.0	0.0		0.0	
Geometry Group	4a		5		2		2	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.5		0.2		0.2	

hRT-adj	-0.6	-0.7	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.1	0.1 -0.7	0.0	0.0

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	472		189	80	389		271	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.42		0.17	0.07	0.35		0.24	
hd, final value	7.54		8.80	7.98	7.80		8.25	
x, final value	0.99		0.46	0.18	0.84		0.62	
Move-up time, m	2.0		2.3		2.0		2.0	
Service Time	5.5		6.5	5.7	5.8		6.2	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	472		189	80	389		271	
Service Time	5.5		6.5	5.7	5.8		6.2	
Utilization, x	0.99		0.46	0.18	0.84		0.62	
Dep. headway, hd	7.54		8.80	7.98	7.80		8.25	
Capacity	477		383	330	453		416	
Delay	116.89		18.99	12.40	47.81		24.50	
LOS	F		C	B	E		C	
Approach:								
Delay	116.89		17.03		47.81		24.50	
LOS	F		C		E		C	

Intersection Delay 60.66 Intersection LOS F

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: Todd Price
Agency/Co.: GDOT
Date Performed: 10/15/2014
Analysis Time Period: PM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2 - Newton County
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 - All Way Stop
East/West Street: SR 162
North/South Street: Sr 81

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	190	45	15	315	75	30	105	15	155	235	45
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LT	R	LTR		LTR	
PHF	0.92		0.92	1.00	0.92		0.92	
Flow Rate	292		358	75	162		471	
% Heavy Veh	0		0	0	0		0	
No. Lanes	1		2		1		1	
Opposing-Lanes	2		1		1		1	
Conflicting-lanes	1		1		2		2	
Geometry group	4a		5		2		2	

Duration, T 1.00 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	292		358	75	162		471	
Left-Turn	38		16	0	32		168	
Right-Turn	48		0	75	16		48	
Prop. Left-Turns	0.1		0.0	0.0	0.2		0.4	
Prop. Right-Turns	0.2		0.0	1.0	0.1		0.1	
Prop. Heavy Vehicle	0.0		0.0	0.0	0.0		0.0	
Geometry Group	4a		5		2		2	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.5		0.2		0.2	

hRT-adj	-0.6	-0.7	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.1	0.0 -0.7	-0.0	0.0

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	292		358	75	162		471	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.26		0.32	0.07	0.14		0.42	
hd, final value	7.58		7.75	7.00	8.05		7.00	
x, final value	0.62		0.77	0.15	0.36		0.92	
Move-up time, m	2.0		2.3		2.0		2.0	
Service Time	5.6		5.4	4.7	6.1		5.0	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	292		358	75	162		471	
Service Time	5.6		5.4	4.7	6.1		5.0	
Utilization, x	0.62		0.77	0.15	0.36		0.92	
Dep. headway, hd	7.58		7.75	7.00	8.05		7.00	
Capacity	445		448	325	397		507	
Delay	22.51		34.99	10.90	15.61		65.64	
LOS	C		D	B	C		F	
Approach:								
Delay	22.51		30.82		15.61		65.64	
LOS	C		D		C		F	

Intersection Delay 39.29 Intersection LOS E

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: Todd Price
Agency/Co.: GDOT
Date Performed: 10/15/2014
Analysis Time Period: AM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2 - Newton County
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 - All Way Stop
East/West Street: SR 162
North/South Street: SR 81

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	75	480	105	40	225	130	165	355	30	145	195	40

% Thrus Left Lane

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LT	R	LTR		LTR	
PHF	0.92		0.92	1.00	0.92		1.00	
Flow Rate	716		287	130	596		380	
% Heavy Veh	0		0	0	0		0	
No. Lanes	1		2		1		1	
Opposing-Lanes	2		1		1		1	
Conflicting-lanes	1		1		2		2	
Geometry group	4a		5		2		2	

Duration, T 1.00 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	716		287	130	596		380	
Left-Turn	81		43	0	179		145	
Right-Turn	114		0	130	32		40	
Prop. Left-Turns	0.1		0.1	0.0	0.3		0.4	
Prop. Right-Turns	0.2		0.0	1.0	0.1		0.1	
Prop. Heavy Vehicle	0.0		0.0	0.0	0.0		0.0	
Geometry Group	4a		5		2		2	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.5		0.2		0.2	

BS

hRT-adj	-0.6	-0.7	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.1	0.1 -0.7	0.0	0.0

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	716		287	130	596		380	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.64		0.26	0.12	0.53		0.34	
hd, final value	9.50		10.02	9.20	9.45		9.44	
x, final value	1.89		0.80	0.33	1.56		1.00	
Move-up time, m	2.0		2.3		2.0		2.0	
Service Time	7.5		7.7	6.9	7.4		7.4	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	716		287	130	596		380	
Service Time	7.5		7.7	6.9	7.4		7.4	
Utilization, x	1.89		0.80	0.33	1.56		1.00	
Dep. headway, hd	9.50		10.02	9.20	9.45		9.44	
Capacity	716		360	380	596		382	
Delay	1633		48.80	16.46	1053		139.37	
LOS	F		E	C	F		F	
Approach:								
Delay	1633		38.72		1053		139.37	
LOS	F		E		F		F	

Intersection Delay 884.59 Intersection LOS F

Phone: Fax:
E-Mail:

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Analyst: Todd Price
Agency/Co.: GDOT
Date Performed: 10/15/2014
Analysis Time Period: PM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2 - Newton County
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 - All Way Stop
East/West Street: SR 162
North/South Street: SR 81

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	55	290	65	25	485	115	45	155	25	240	345	70
% Thrus Left Lane												

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LT	R	LTR		LTR	
PHF	0.92		0.92	1.00	0.92		0.92	
Flow Rate	444		554	115	243		710	
% Heavy Veh	0		0	0	0		0	
No. Lanes	1		2		1		1	
Opposing-Lanes	2		1		1		1	
Conflicting-lanes	1		1		2		2	
Geometry group	4a		5		2		2	

Duration, T 1.00 hrs.

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	444		554	115	243		710	
Left-Turn	59		27	0	48		260	
Right-Turn	70		0	115	27		76	
Prop. Left-Turns	0.1		0.0	0.0	0.2		0.4	
Prop. Right-Turns	0.2		0.0	1.0	0.1		0.1	
Prop. Heavy Vehicle	0.0		0.0	0.0	0.0		0.0	
Geometry Group	4a		5		2		2	
Adjustments Exhibit 17-33:								
hLT-adj	0.2		0.5		0.2		0.2	

hRT-adj	-0.6	-0.7	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7
hadj, computed	-0.1	0.0 -0.7	-0.0	0.0

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	444		554	115	243		710	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.39		0.49	0.10	0.22		0.63	
hd, final value	8.95		9.22	8.46	9.76		8.88	
x, final value	1.10		1.42	0.27	0.66		1.75	
Move-up time, m	2.0		2.3		2.0		2.0	
Service Time	7.0		6.9	6.2	7.8		6.9	

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	444		554	115	243		710	
Service Time	7.0		6.9	6.2	7.8		6.9	
Utilization, x	1.10		1.42	0.27	0.66		1.75	
Dep. headway, hd	8.95		9.22	8.46	9.76		8.88	
Capacity	444		554	365	369		710	
Delay	268.53		795.46	14.29	31.09		1383	
LOS	F		F	B	D		F	
Approach:								
Delay	268.53		661.18		31.09		1383	
LOS	F		F		D		F	

Intersection Delay 750.82 Intersection LOS F

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: AM Peak
Intersection: SR 71 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 Single Lane Roundabout
East/West Street: SR 162
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	50	315	70	30	145	80	110	230	20	95	130	25
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	57	356	79	34	164	90	124	260	23	107	147	28
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1			1			1			1		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	288	441	520	322
Exit. Flow	486	316	407	260

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		492			288			407			282	
Entry Cap.		847			727			672			819	
Volume (vph)		473			277			391			271	
Cap. (vph)		814			699			646			788	

C1

v/c Ratio	0.58	0.40	0.61	0.34
Critical Lane	*	*	*	*
Lane Delay	13.3	10.5	16.8	8.7
Lane LOS	B	B	C	A
95 % Queue	3.8	1.9	4.1	1.5
Approach:				
Delay	13.28	10.47	16.79	8.67
LOS	B	B	C	A

Intersection Delay 12.81 Intersection LOS B

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: PM Peak
Intersection:
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 Single Lane Roundabout
East/West Street: SR 162
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	190	45	15	315	75	30	105	15	155	235	45
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	40	215	51	17	356	85	34	119	17	175	266	51
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1			1			1			1		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	458	193	430	407
Exit. Flow	407	441	244	334

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		306			458			170			492	
Entry Cap.		715			932			735			752	
Volume (vph)		294			440			163			473	
Cap. (vph)		688			896			707			723	

v/c Ratio	0.43	0.49	0.23	0.65
Critical Lane	*	*	*	*
Lane Delay	11.2	10.3	7.8	17.2
Lane LOS	B	B	A	C
95 % Queue	2.1	2.8	0.9	4.9
Approach:				
Delay	11.22	10.30	7.77	17.17
LOS	B	B	A	C

Intersection Delay 12.57 Intersection LOS B

MOVEMENT SUMMARY

Site: 1-Lane US 2018 AM - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	33	4.0	0.224	15.2	LOS B	1.3	34.5	0.65	0.84	28.5
6	T	49	4.0	0.224	9.6	LOS A	1.3	34.5	0.65	0.71	30.5
16	R	87	4.0	0.224	10.5	LOS B	1.3	34.5	0.65	0.74	30.5
Approach		168	4.0	0.224	11.2	LOS B	1.3	34.5	0.65	0.75	30.1
North East: State Route 81											
7	L	103	3.5	0.278	13.6	LOS B	1.7	43.5	0.48	0.77	29.3
4	T	141	3.5	0.278	8.0	LOS A	1.7	43.5	0.48	0.58	31.3
14	R	27	3.5	0.278	8.9	LOS A	1.7	43.5	0.48	0.63	31.1
Approach		272	3.5	0.278	10.2	LOS B	1.7	43.5	0.48	0.66	30.5
North West: State Route 162											
5	L	54	4.0	0.513	14.8	LOS B	3.8	97.7	0.66	0.83	28.9
2	T	342	4.0	0.513	9.2	LOS A	3.8	97.7	0.66	0.70	30.6
12	R	76	4.0	0.513	10.1	LOS B	3.8	97.7	0.66	0.73	30.6
Approach		473	4.0	0.513	10.0	LOS A	3.8	97.7	0.66	0.72	30.4
South West: State Route 81											
3	L	120	3.5	0.547	18.5	LOS B	4.6	117.6	0.82	0.99	26.9
8	T	250	3.5	0.547	12.9	LOS B	4.6	117.6	0.82	0.92	28.8
18	R	22	3.5	0.547	13.8	LOS B	4.6	117.6	0.82	0.94	28.6
Approach		391	3.5	0.547	14.6	LOS B	4.6	117.6	0.82	0.94	28.2
All Vehicles		1304	3.7	0.547	11.6	LOS B	4.6	117.6	0.67	0.78	29.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane US 2018 AM

EF=1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	33	4.0	0.421	16.5	LOS B	2.8	72.1	0.75	0.91	27.9
6	T	158	4.0	0.421	10.9	LOS B	2.8	72.1	0.75	0.81	30.2
16	R	87	4.0	0.421	11.8	LOS B	2.8	72.1	0.75	0.84	30.0
Approach		277	4.0	0.421	11.8	LOS B	2.8	72.1	0.75	0.83	29.8
North East: State Route 81											
7	L	103	3.5	0.351	15.1	LOS B	2.2	55.4	0.62	0.83	28.5
4	T	141	3.5	0.351	9.5	LOS A	2.2	55.4	0.62	0.69	30.6
14	R	27	3.5	0.351	10.4	LOS B	2.2	55.4	0.62	0.73	30.6
Approach		272	3.5	0.351	11.7	LOS B	2.2	55.4	0.62	0.75	29.8
North West: State Route 162											
5	L	54	4.0	0.578	16.2	LOS B	5.0	129.0	0.73	0.88	28.1
2	T	342	4.0	0.578	10.6	LOS B	5.0	129.0	0.73	0.77	30.3
12	R	76	4.0	0.578	11.5	LOS B	5.0	129.0	0.73	0.80	30.2
Approach		473	4.0	0.578	11.4	LOS B	5.0	129.0	0.73	0.79	30.0
South West: State Route 81											
3	L	120	3.5	0.630	21.3	LOS C	5.9	151.5	0.88	1.08	25.5
8	T	250	3.5	0.630	15.7	LOS B	5.9	151.5	0.88	1.03	27.2
18	R	22	3.5	0.630	16.6	LOS B	5.9	151.5	0.88	1.04	27.0
Approach		391	3.5	0.630	17.5	LOS B	5.9	151.5	0.88	1.05	26.6
All Vehicles		1413	3.8	0.630	13.2	LOS B	5.9	151.5	0.75	0.86	28.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

C-6

MOVEMENT SUMMARY

Site: 1-Lane 2018 PM - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	16	4.0	0.427	13.7	LOS B	3.0	78.5	0.52	0.79	29.5
6	T	342	4.0	0.427	8.1	LOS A	3.0	78.5	0.52	0.60	31.3
16	R	82	4.0	0.427	9.0	LOS A	3.0	78.5	0.52	0.65	31.2
Approach		440	4.0	0.427	8.5	LOS A	3.0	78.5	0.52	0.62	31.2
North East: State Route 81											
7	L	168	3.5	0.587	17.5	LOS B	5.3	135.4	0.79	0.94	27.3
4	T	255	3.5	0.587	11.9	LOS B	5.3	135.4	0.79	0.86	29.3
14	R	49	3.5	0.587	12.8	LOS B	5.3	135.4	0.79	0.88	29.2
Approach		473	3.5	0.587	14.0	LOS B	5.3	135.4	0.79	0.89	28.5
North West: State Route 162											
5	L	38	4.0	0.399	15.8	LOS B	2.7	69.2	0.74	0.89	28.3
2	T	207	4.0	0.399	10.3	LOS B	2.7	69.2	0.74	0.79	30.3
12	R	49	4.0	0.399	11.1	LOS B	2.7	69.2	0.74	0.81	30.4
Approach		293	4.0	0.399	11.1	LOS B	2.7	69.2	0.74	0.80	30.0
South West: State Route 81											
3	L	33	3.5	0.206	15.1	LOS B	1.2	30.0	0.61	0.84	28.6
8	T	114	3.5	0.206	9.5	LOS A	1.2	30.0	0.61	0.69	30.8
18	R	16	3.5	0.206	10.4	LOS B	1.2	30.0	0.61	0.73	30.8
Approach		163	3.5	0.206	10.7	LOS B	1.2	30.0	0.61	0.73	30.3
All Vehicles		1370	3.8	0.587	11.2	LOS B	5.3	135.4	0.67	0.77	29.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2018 PM

EF=1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	16	4.0	0.471	14.1	LOS B	3.5	89.5	0.57	0.80	29.3
6	T	342	4.0	0.471	8.5	LOS A	3.5	89.5	0.57	0.63	31.1
16	R	82	4.0	0.471	9.3	LOS A	3.5	89.5	0.57	0.67	31.0
Approach		440	4.0	0.471	8.8	LOS A	3.5	89.5	0.57	0.64	31.0
North East: State Route 81											
7	L	168	3.5	0.668	20.2	LOS C	6.9	177.0	0.86	1.02	26.0
4	T	255	3.5	0.668	14.6	LOS B	6.9	177.0	0.86	0.97	27.7
14	R	49	3.5	0.668	15.4	LOS B	6.9	177.0	0.86	0.99	27.6
Approach		473	3.5	0.668	16.6	LOS B	6.9	177.0	0.86	0.99	27.1
North West: State Route 162											
5	L	38	4.0	0.458	17.2	LOS B	3.3	84.4	0.78	0.94	27.6
2	T	207	4.0	0.458	11.6	LOS B	3.3	84.4	0.78	0.86	29.7
12	R	49	4.0	0.458	12.5	LOS B	3.3	84.4	0.78	0.88	29.6
Approach		293	4.0	0.458	12.5	LOS B	3.3	84.4	0.78	0.87	29.4
South West: State Route 81											
3	L	33	3.5	0.235	15.7	LOS B	1.3	33.8	0.63	0.87	28.3
8	T	114	3.5	0.235	10.1	LOS B	1.3	33.8	0.63	0.72	30.7
18	R	16	3.5	0.235	11.0	LOS B	1.3	33.8	0.63	0.76	30.5
Approach		163	3.5	0.235	11.3	LOS B	1.3	33.8	0.63	0.76	30.1
All Vehicles		1370	3.8	0.668	12.6	LOS B	6.9	177.0	0.72	0.82	29.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: AM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 Single Lane Roundabout
East/West Street:
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	75	480	105	40	225	130	165	355	30	145	195	40
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	85	543	119	45	254	147	187	401	34	164	220	45
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1			1			1			1		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	429	673	792	486
Exit. Flow	741	486	633	384

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		747			446			622			429	
Entry Cap.		736			577			512			695	
Volume (vph)		718			429			598			412	
Cap. (vph)		708			555			492			668	

v/c Ratio	1.01	0.77	1.22	0.62
Critical Lane	*	*	*	*
Lane Delay	61.6	29.0	140.6	16.8
Lane LOS	F	D	F	C
95 % Queue	17.1	7.0	23.0	4.3
Approach:				
Delay	61.64	29.00	140.55	16.78
LOS	F	D	F	C

Intersection Delay 68.46 Intersection LOS F

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: PM Peak
Intersection:
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 Single Lane Roundabout
East/West Street:
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	55	290	65	25	485	115	45	155	25	240	345	70
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	62	328	73	28	548	130	51	175	28	271	390	79
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1			1			1			1		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	689	288	661	627
Exit. Flow	627	678	367	491

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		463			706			254			740	
Entry Cap.		567			847			583			604	
Volume (vph)		445			679			244			712	
Cap. (vph)		545			814			561			581	

v/c Ratio	0.82	0.83	0.44	1.22
Critical Lane	*	*	*	*
Lane Delay	33.7	26.5	13.4	139.0
Lane LOS	D	D	B	F
95 % Queue	8.1	9.6	2.2	26.4
Approach:				
Delay	33.72	26.51	13.45	139.02
LOS	D	D	B	F

Intersection Delay 65.03 Intersection LOS F

MOVEMENT SUMMARY

Site: 1-Lane 2038 AM - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	43	4.0	0.667	21.7	LOS C	7.0	179.7	0.94	1.09	25.5
6	T	245	4.0	0.667	16.1	LOS B	7.0	179.7	0.94	1.07	27.0
16	R	141	4.0	0.667	17.0	LOS B	7.0	179.7	0.94	1.08	26.9
Approach		429	4.0	0.667	17.0	LOS B	7.0	179.7	0.94	1.08	26.8
North East: State Route 81											
7	L	158	3.5	0.546	17.5	LOS B	4.6	117.8	0.80	0.94	27.3
4	T	212	3.5	0.546	11.9	LOS B	4.6	117.8	0.80	0.87	29.3
14	R	43	3.5	0.546	12.8	LOS B	4.6	117.8	0.80	0.89	29.2
Approach		413	3.5	0.546	14.1	LOS B	4.6	117.8	0.80	0.90	28.5
North West: State Route 162											
5	L	82	4.0	0.917	32.2	LOS C	20.0	514.9	1.00	1.33	21.5
2	T	522	4.0	0.917	26.6	LOS C	20.0	514.9	1.00	1.33	22.4
12	R	114	4.0	0.917	27.5	LOS C	20.0	514.9	1.00	1.33	22.3
Approach		717	4.0	0.917	27.4	LOS C	20.0	514.9	1.00	1.33	22.3
South West: State Route 81											
3	L	179	3.5	1.227	142.2	LOS F	52.2	1341.8	1.00	2.62	8.1
8	T	386	3.5	1.227	136.6	LOS F	52.2	1341.8	1.00	2.62	8.0
18	R	33	3.5	1.227	137.5	LOS F	52.2	1341.8	1.00	2.62	7.9
Approach		598	3.5	1.227	138.3	LOS F	52.2	1341.8	1.00	2.62	8.0
All Vehicles		2158	3.8	1.227	53.5	LOS D	52.2	1341.8	0.95	1.55	15.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

MOVEMENT SUMMARY

Site: 1-Lane 2038 PM - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	27	4.0	0.729	17.9	LOS B	9.2	238.4	0.86	0.91	27.4
6	T	527	4.0	0.729	12.3	LOS B	9.2	238.4	0.86	0.85	29.4
16	R	125	4.0	0.729	13.1	LOS B	9.2	238.4	0.86	0.87	29.2
Approach		679	4.0	0.729	12.6	LOS B	9.2	238.4	0.86	0.86	29.3
North East: State Route 81											
7	L	261	3.5	1.350	190.0	LOS F	75.4	1939.0	1.00	3.17	6.3
4	T	375	3.5	1.350	184.4	LOS F	75.4	1939.0	1.00	3.17	6.2
14	R	76	3.5	1.350	185.3	LOS F	75.4	1939.0	1.00	3.17	6.2
Approach		712	3.5	1.350	186.5	LOS F	75.4	1939.0	1.00	3.17	6.3
North West: State Route 162											
5	L	60	4.0	0.760	25.5	LOS C	9.2	237.2	0.99	1.18	23.9
2	T	315	4.0	0.760	19.9	LOS B	9.2	237.2	0.99	1.18	25.1
12	R	71	4.0	0.760	20.8	LOS C	9.2	237.2	0.99	1.18	25.1
Approach		446	4.0	0.760	20.8	LOS C	9.2	237.2	0.99	1.18	24.9
South West: State Route 81											
3	L	49	3.5	0.432	18.6	LOS B	3.0	75.8	0.81	0.99	26.9
8	T	168	3.5	0.432	13.0	LOS B	3.0	75.8	0.81	0.91	28.8
18	R	27	3.5	0.432	13.9	LOS B	3.0	75.8	0.81	0.93	28.6
Approach		245	3.5	0.432	14.2	LOS B	3.0	75.8	0.81	0.93	28.4
All Vehicles		2082	3.8	1.350	74.1	LOS E	75.4	1939.0	0.93	1.73	12.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2038 AM

EF=1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	43	4.0	0.714	23.6	LOS C	7.9	203.2	0.95	1.14	24.7
6	T	245	4.0	0.714	18.0	LOS B	7.9	203.2	0.95	1.12	26.0
16	R	141	4.0	0.714	18.8	LOS B	7.9	203.2	0.95	1.12	26.0
Approach		429	4.0	0.714	18.8	LOS B	7.9	203.2	0.95	1.12	25.9
North East: State Route 81											
7	L	158	3.5	0.612	19.4	LOS B	5.7	145.3	0.85	1.01	26.3
4	T	212	3.5	0.612	13.8	LOS B	5.7	145.3	0.85	0.95	28.1
14	R	43	3.5	0.612	14.7	LOS B	5.7	145.3	0.85	0.96	28.0
Approach		413	3.5	0.612	16.1	LOS B	5.7	145.3	0.85	0.97	27.4
North West: State Route 162											
5	L	82	4.0	1.039	60.4	LOS E	34.6	892.0	1.00	1.83	15.1
2	T	522	4.0	1.039	54.8	LOS D	34.6	892.0	1.00	1.83	15.3
12	R	114	4.0	1.039	55.7	LOS E	34.6	892.0	1.00	1.83	15.2
Approach		717	4.0	1.039	55.6	LOS E	34.6	892.0	1.00	1.83	15.3
South West: State Route 81											
3	L	179	3.5	1.372	204.1	LOS F	66.9	1720.3	1.00	3.01	6.0
8	T	386	3.5	1.372	198.5	LOS F	66.9	1720.3	1.00	3.01	5.8
18	R	33	3.5	1.372	199.4	LOS F	66.9	1720.3	1.00	3.01	5.8
Approach		598	3.5	1.372	200.2	LOS F	66.9	1720.3	1.00	3.01	5.9
All Vehicles		2158	3.8	1.372	80.8	LOS F	66.9	1720.3	0.96	1.85	12.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2038 PM

EF = 1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	27	4.0	0.809	21.4	LOS C	12.7	327.9	0.97	1.00	25.7
6	T	527	4.0	0.809	15.8	LOS B	12.7	327.9	0.97	0.99	27.3
16	R	125	4.0	0.809	16.7	LOS B	12.7	327.9	0.97	0.99	27.2
Approach		679	4.0	0.809	16.2	LOS B	12.7	327.9	0.97	0.99	27.2
North East: State Route 81											
7	L	261	3.5	1.381	203.2	LOS F	79.0	2031.0	1.00	3.24	6.0
4	T	375	3.5	1.381	197.6	LOS F	79.0	2031.0	1.00	3.24	5.9
14	R	76	3.5	1.381	198.5	LOS F	79.0	2031.0	1.00	3.24	5.8
Approach		712	3.5	1.381	199.7	LOS F	79.0	2031.0	1.00	3.24	5.9
North West: State Route 162											
5	L	60	4.0	0.750	24.8	LOS C	8.9	229.8	0.98	1.17	24.2
2	T	315	4.0	0.750	19.2	LOS B	8.9	229.8	0.98	1.16	25.5
12	R	71	4.0	0.750	20.1	LOS C	8.9	229.8	0.98	1.16	25.4
Approach		446	4.0	0.750	20.1	LOS C	8.9	229.8	0.98	1.16	25.3
South West: State Route 81											
3	L	49	3.5	0.429	18.5	LOS B	2.9	75.1	0.81	0.98	26.9
8	T	168	3.5	0.429	12.9	LOS B	2.9	75.1	0.81	0.91	28.9
18	R	27	3.5	0.429	13.8	LOS B	2.9	75.1	0.81	0.93	28.7
Approach		245	3.5	0.429	14.1	LOS B	2.9	75.1	0.81	0.93	28.4
All Vehicles		2082	3.8	1.381	79.6	LOS E	79.0	2031.0	0.97	1.79	12.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Monday, February 16, 2015 1:31:01 PM
SIDRA INTERSECTION 5.1.8.2059
Project: \\GDOT_TN_SV20a\rdcommon\Newton\0009919\Traffic Data\Sidra Model 0009919.sip
8001140, GEORGIA DEPARTMENT OF TRANSPORTATION, FLOATING

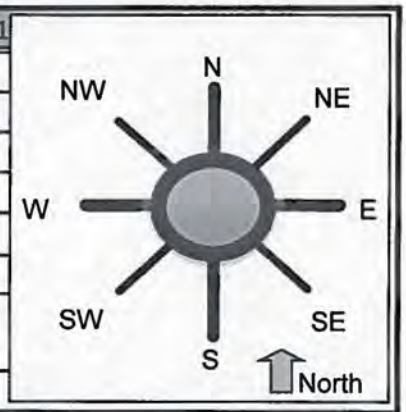
Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2018 AM Peak
County/District:	D2 - Newton County
Intersection Name:	SR81 @ SR162 SINGLE LANES



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph				80		230		50
	E (3), vph								
	SE (4), vph		95				20		315
	S (5), vph								
	SW (6), vph		130		30				70
	W (7), vph								
	NW (8), vph		25		145		110		
Output	Total Vehicles	0	250	0	255	0	360	0	435

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	90	0	260	0	57
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	107	0	0	0	23	0	356
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	147	0	34	0	0	0	79
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	28	0	164	0	124	0	0
Entry flow, pcu/h	0	283	0	288	0	407	0	492
Conflicting flow, pcu/h	0	322	0	441	0	520	0	288

Roundabout Type	Standard Single Lane or Urban Compact

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness								
HCM 2010 Model (build)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	787	NA	699	NA	646	NA	814
Entry Flow Rates, vph	NA	272	NA	277	NA	391	NA	473
V/C ratio		**0.35**		**0.40**		**0.61**		**0.58**
Control Delay, s/veh		**9**		**10**		**17**		**13**
LOS		A		B		C		B
95th % Queue (ft)		**40**		**49**		**106**		**99**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	991	NA	901	NA	846	NA	1018
Entry Flow Rates, vph	NA	272	NA	277	NA	391	NA	473
V/C ratio		**0.29**		**0.32**		**0.48**		**0.48**
Control Delay, sec/pcu		**7**		**7**		**11**		**9**
LOS		A		A		B		A
95th % Queue (ft)		**31**		**36**		**69**		**70**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

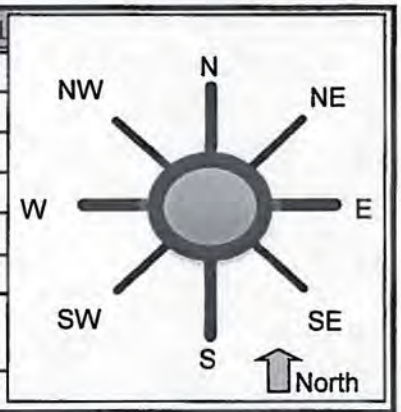
Bypass Lane Merge Point Analysis (if applicable)						
Bypass Characteristics	**Bypass #1**	**Bypass #2**	**Bypass #3**	**Bypass #4**	**Bypass #5**	**Bypass #6**
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
F_{ped}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr						
Conflicting Flow, pcu/hr						
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph						
Flow Rates of Exiting Traffic, vph						
V/C ratio						
Control Delay, s/veh						
LOS						

95th % Queue (ft)						
Approach w/Bypass Delay, s/veh						
Approach w/Bypass LOS						

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2018 PM Peak
County/District:	D2 - Newton County
Intersection Name:	SR 81 @ SR162 Single Lane



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph								
Exit	NE (2), vph				75		105		35
Legs	E (3), vph								
(TO)	SE (4), vph		155				15		190
	S (5), vph								
	SW (6), vph		235		15				45
	W (7), vph								
	NW (8), vph		45		315		30		
Output	Total Vehicles	0	435	0	405	0	150	0	270

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	85	0	119	0	40
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	175	0	0	0	17	0	215
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	266	0	17	0	0	0	51
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	51	0	356	0	34	0	0
Entry flow, pcu/h	0	492	0	458	0	170	0	305
Conflicting flow, pcu/h	0	407	0	192	0	430	0	458

Roundabout Type	Standard Single Lane or Urban Compact

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	NA	723	NA	897	NA	707	NA	687
Entry Flow Rates, vph	NA	473	NA	440	NA	163	NA	293
V/C ratio		**0.65**		**0.49**		**0.23**		**0.43**
Control Delay, s/veh		**17**		**10**		**8**		**11**
LOS		C		B		A		B
95th % Queue (ft)		**127**		**72**		**23**		**56**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	926	NA	1099	NA	909	NA	889
Entry Flow Rates, vph	NA	473	NA	440	NA	163	NA	293
V/C ratio		**0.53**		**0.42**		**0.19**		**0.34**
Control Delay, sec/pcu		**11**		**8**		**6**		**8**
LOS		B		A		A		A
95th % Queue (ft)		**83**		**54**		**18**		**40**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)

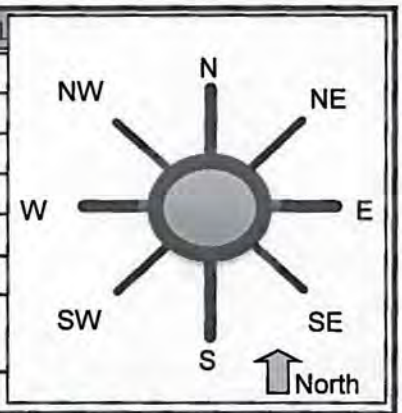
Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
F_{ped}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr						
Conflicting Flow, pcu/hr						
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph						
Flow Rates of Exiting Traffic, vph						
V/C ratio						
Control Delay, s/veh						
LOS						

95th % Queue (ft)						
Approach w/Bypass Delay, s/veh						
Approach w/Bypass LOS						

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2038 AM Peak
County/District:	D2 - Newton County
Intersection Name:	SR81 @ SR162 SINGLE LANES



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph				130		355		75
	E (3), vph								
	SE (4), vph		145				30		480
	S (5), vph								
	SW (6), vph		195		40				105
	W (7), vph								
	NW (8), vph		40		225		165		
Output	Total Vehicles	0	380	0	395	0	550	0	660

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	147	0	401	0	85
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	164	0	0	0	34	0	543
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	220	0	45	0	0	0	119
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	45	0	254	0	187	0	0
Entry flow, pcu/h	0	430	0	447	0	622	0	746
Conflicting flow, pcu/h	0	486	0	673	0	791	0	430

Roundabout Type	Standard Single Lane or Urban Compact

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness								
HCM 2010 Model (build)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	668	NA	555	NA	492	NA	707
Entry Flow Rates, vph	NA	413	NA	429	NA	598	NA	717
V/C ratio		**0.62**		**0.77**		**1.21**		**1.01**
Control Delay, s/veh		**17**		**29**		**140**		**62**
LOS		C		D		F		F
95th % Queue (ft)		**111**		**184**		**596**		**443**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	869	NA	748	NA	681	NA	909
Entry Flow Rates, vph	NA	413	NA	429	NA	598	NA	717
V/C ratio		**0.49**		**0.60**		**0.91**		**0.82**
Control Delay, sec/pcu		**11**		**15**		**41**		**23**
LOS		B		B		E		C
95th % Queue (ft)		**73**		**104**		**313**		**244**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

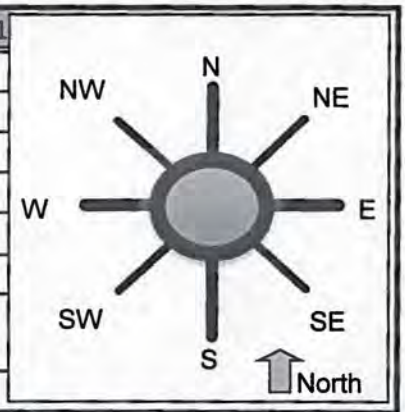
Bypass Lane Merge Point Analysis (if applicable)						
Bypass Characteristics	**Bypass #1**	**Bypass #2**	**Bypass #3**	**Bypass #4**	**Bypass #5**	**Bypass #6**
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
F_{ped}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr						
Conflicting Flow, pcu/hr						
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph						
Flow Rates of Exiting Traffic, vph						
V/C ratio						
Control Delay, s/veh						
LOS						

95th % Queue (ft)						
Approach w/Bypass Delay, s/veh						
Approach w/Bypass LOS						

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2038 PM Peak
County/District:	D2 - Newton County
Intersection Name:	SR 81 @ SR162 Single Lane



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph				115		155		55
	E (3), vph								
	SE (4), vph		240				25		290
	S (5), vph								
	SW (6), vph		345		25				65
	W (7), vph								
	NW (8), vph		70		485		45		
Output	Total Vehicles	0	655	0	625	0	225	0	410

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	130	0	175	0	62
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	271	0	0	0	28	0	328
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	390	0	28	0	0	0	73
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	79	0	548	0	51	0	0
Entry flow, pcu/h	0	740	0	707	0	254	0	463
Conflicting flow, pcu/h	0	627	0	288	0	661	0	690

Roundabout Type	Standard Single Lane or Urban Compact

Enter type here... | Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	NA	580	NA	814	NA	561	NA	545
Entry Flow Rates, vph	NA	712	NA	679	NA	245	NA	446
V/C ratio		**1.23**		**0.83**		**0.44**		**0.82**
Control Delay, s/veh		**140**		**27**		**13**		**34**
LOS		F		D		B		D
95th % Queue (ft)		**690**		**250**		**57**		**211**

Calibrated Model (future)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	NA	776	NA	1018	NA	755	NA	738
Entry Flow Rates, vph	NA	712	NA	679	NA	245	NA	446
V/C ratio		**0.95**		**0.69**		**0.34**		**0.63**
Control Delay, sec/pcu		**45**		**15**		**9**		**16**
LOS		E		B		A		C
95th % Queue (ft)		**379**		**154**		**39**		**116**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)

Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
F_{ped}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr						
Conflicting Flow, pcu/hr						
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph						
Flow Rates of Exiting Traffic, vph						
V/C ratio						
Control Delay, s/veh						
LOS						

95th % Queue (ft)						
Approach w/Bypass Delay, s/veh						
Approach w/Bypass LOS						

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2014
Analysis Time Period: AM Peak
Intersection: SR 71 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 Single Lane Roundabout + Turn Lanes
East/West Street: SR 162
North/South Street: SR 81

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	50	315	70	30	145	80	110	230	20	95	130	25
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			1			1			0			2
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	57	356	79	34	164	90	124	260	23	107	147	28
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1		1	1		1	1			1		1

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	288	441	520	322
Exit. Flow	486	288	317	181

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		413	79		198	90		407			254	28
Entry Cap.		847	943		727	823		672			819	
Volume (vph)		397	76		190	87		391			244	27
Cap. (vph)		814	907		699	791		646			788	

D1

v/c Ratio	0.49	0.08	0.27	0.11	0.61		0.31	
Critical Lane	*		*		*			
Lane Delay	11.0	4.8	8.4	5.7	16.8		8.2	0.0
Lane LOS	B		A		C		A	
95 % Queue	2.7	0.3	1.1	0.4	4.1		1.3	
Approach:								
Delay	10.00		7.56		16.79		7.34	
LOS	A		A		C		A	

Intersection Delay 10.89 Intersection LOS B

D2

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2014
Analysis Time Period: PM Peak
Intersection:
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 Single Lane Roundabout + Turning Lanes
East/West Street: SR 162
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	190	45	15	315	75	30	105	15	155	235	45
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			1			1			0			1
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	40	215	51	17	356	85	34	119	17	175	266	51
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1		1	1		1	1			1		1

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	458	193	430	407
Exit. Flow	407	390	159	283

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		255	51		373	85		170			441	51
Entry Cap.		715	851		932	964		735			752	765
Volume (vph)		245	49		359	82		163			424	49
Cap. (vph)		688	818		896	927		707			723	736

D3

v/c Ratio	0.36	0.06	0.40	0.09	0.23		0.59	0.07
Critical Lane	*		*		*		*	
Lane Delay	9.9	5.0	8.7	4.7	7.8		14.7	5.6
Lane LOS	A		A		A		B	
95 % Queue	1.6	0.2	1.9	0.3	0.9		3.9	0.2
Approach:								
Delay	9.07		7.94		7.77		13.78	
LOS	A		A		A		B	

Intersection Delay 10.17 Intersection LOS B

MOVEMENT SUMMARY

Site: 1-Lane US 2018 AM + Turn Lane - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	33	4.0	0.161	14.1	LOS B	1.0	27.1	0.59	0.84	30.2
6	T	158	4.0	0.161	5.4	LOS A	1.0	27.1	0.59	0.49	32.2
16	R	87	4.0	0.067	6.1	LOS A	0.4	10.0	0.46	0.50	32.4
Approach		277	4.0	0.161	6.7	LOS A	1.0	27.1	0.55	0.54	32.0
North East: State Route 81											
7	L	103	3.5	0.184	13.6	LOS B	1.1	28.5	0.48	0.79	30.0
4	T	141	3.5	0.184	4.9	LOS A	1.1	28.5	0.48	0.45	32.6
14	R	27	3.5	0.020	5.9	LOS A	0.1	2.7	0.40	0.46	32.8
Approach		272	3.5	0.184	8.3	LOS A	1.1	28.5	0.47	0.58	31.5
North West: State Route 162											
5	L	54	4.0	0.295	13.6	LOS B	1.9	50.1	0.50	0.86	30.3
2	T	342	4.0	0.295	4.9	LOS A	1.9	50.1	0.50	0.44	32.8
12	R	76	4.0	0.053	5.6	LOS A	0.3	7.2	0.33	0.44	33.2
Approach		473	4.0	0.295	6.0	LOS A	1.9	50.1	0.47	0.49	32.5
South West: State Route 81											
3	L	120	3.5	0.438	16.0	LOS B	3.1	78.5	0.74	0.90	29.1
8	T	250	3.5	0.438	7.3	LOS A	3.1	78.5	0.74	0.66	31.0
18	R	22	3.5	0.438	8.9	LOS A	3.1	78.5	0.74	0.75	31.1
Approach		391	3.5	0.438	10.0	LOS B	3.1	78.5	0.74	0.74	30.4
All Vehicles		1413	3.8	0.438	7.7	LOS A	3.1	78.5	0.56	0.59	31.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

D5

MOVEMENT SUMMARY

Site: 1-Lane US 2018 AM + Turn Lane

1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	33	4.0	0.183	14.4	LOS B	1.2	30.1	0.61	0.86	30.0
6	T	158	4.0	0.183	5.7	LOS A	1.2	30.1	0.61	0.52	32.1
16	R	87	4.0	0.075	6.2	LOS A	0.4	11.1	0.48	0.52	32.4
Approach		277	4.0	0.183	6.9	LOS A	1.2	30.1	0.57	0.56	31.9
North East: State Route 81											
7	L	103	3.5	0.207	13.9	LOS B	1.2	31.6	0.50	0.80	29.9
4	T	141	3.5	0.207	5.2	LOS A	1.2	31.6	0.50	0.47	32.4
14	R	27	3.5	0.022	6.0	LOS A	0.1	3.0	0.42	0.47	32.7
Approach		272	3.5	0.207	8.6	LOS A	1.2	31.6	0.49	0.59	31.4
North West: State Route 162											
5	L	54	4.0	0.329	13.9	LOS B	2.2	56.2	0.53	0.87	30.2
2	T	342	4.0	0.329	5.2	LOS A	2.2	56.2	0.53	0.47	32.6
12	R	76	4.0	0.058	5.7	LOS A	0.3	7.9	0.34	0.45	33.1
Approach		473	4.0	0.329	6.3	LOS A	2.2	56.2	0.50	0.51	32.4
South West: State Route 81											
3	L	120	3.5	0.500	17.6	LOS B	3.9	99.5	0.78	0.96	28.3
8	T	250	3.5	0.500	8.9	LOS A	3.9	99.5	0.78	0.82	30.8
18	R	22	3.5	0.500	10.4	LOS B	3.9	99.5	0.78	0.85	30.9
Approach		391	3.5	0.500	11.6	LOS B	3.9	99.5	0.78	0.86	29.9
All Vehicles		1413	3.8	0.500	8.3	LOS A	3.9	99.5	0.59	0.63	31.4

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

D6

MOVEMENT SUMMARY

Site: 1-Lane 2018 PM + Turn Lane - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	16	4.0	0.248	13.2	LOS B	1.6	40.6	0.40	0.90	30.5
6	T	342	4.0	0.248	4.5	LOS A	1.6	40.6	0.40	0.40	33.5
16	R	82	4.0	0.056	11.1	LOS B	0.3	7.6	0.31	0.84	30.7
Approach		440	4.0	0.248	6.0	LOS A	1.6	40.6	0.38	0.50	32.9
North East: State Route 81											
7	L	168	3.5	0.338	14.3	LOS B	2.3	59.7	0.60	0.82	29.8
4	T	255	3.5	0.338	5.6	LOS A	2.3	59.7	0.60	0.51	31.8
14	R	49	3.5	0.039	6.3	LOS A	0.2	5.5	0.48	0.50	32.3
Approach		473	3.5	0.338	8.8	LOS A	2.3	59.7	0.59	0.62	31.1
North West: State Route 162											
5	L	38	4.0	0.209	14.3	LOS B	1.4	35.7	0.61	0.86	30.1
2	T	207	4.0	0.209	5.6	LOS A	1.4	35.7	0.61	0.51	32.1
12	R	49	4.0	0.037	5.9	LOS A	0.2	5.3	0.42	0.47	32.6
Approach		293	4.0	0.209	6.8	LOS A	1.4	35.7	0.58	0.55	31.9
South West: State Route 81											
3	L	33	3.5	0.169	14.7	LOS B	1.0	24.8	0.57	0.86	29.7
8	T	114	3.5	0.169	6.0	LOS A	1.0	24.8	0.57	0.54	32.2
18	R	16	3.5	0.169	7.6	LOS A	1.0	24.8	0.57	0.63	32.0
Approach		163	3.5	0.169	7.9	LOS A	1.0	24.8	0.57	0.61	31.6
All Vehicles		1370	3.8	0.338	7.3	LOS A	2.3	59.7	0.52	0.56	31.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2018 PM + Turn Lane

1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	16	4.0	0.273	13.3	LOS B	1.7	45.0	0.42	0.90	30.5
6	T	342	4.0	0.273	4.6	LOS A	1.7	45.0	0.42	0.41	33.4
16	R	82	4.0	0.062	5.6	LOS A	0.3	8.4	0.32	0.44	33.2
Approach		440	4.0	0.273	5.1	LOS A	1.7	45.0	0.40	0.44	33.2
North East: State Route 81											
7	L	168	3.5	0.381	14.7	LOS B	2.6	67.6	0.63	0.84	29.6
4	T	255	3.5	0.381	6.0	LOS A	2.6	67.6	0.63	0.55	31.6
14	R	49	3.5	0.043	6.5	LOS A	0.2	6.1	0.50	0.52	32.3
Approach		473	3.5	0.381	9.1	LOS A	2.6	67.6	0.62	0.65	30.9
North West: State Route 162											
5	L	38	4.0	0.236	14.6	LOS B	1.5	39.8	0.63	0.87	29.9
2	T	207	4.0	0.236	5.9	LOS A	1.5	39.8	0.63	0.54	32.0
12	R	49	4.0	0.041	6.0	LOS A	0.2	5.8	0.44	0.48	32.6
Approach		293	4.0	0.236	7.1	LOS A	1.5	39.8	0.60	0.57	31.8
South West: State Route 81											
3	L	33	3.5	0.191	15.1	LOS B	1.1	27.7	0.59	0.88	29.5
8	T	114	3.5	0.191	6.4	LOS A	1.1	27.7	0.59	0.58	32.1
18	R	16	3.5	0.191	8.0	LOS A	1.1	27.7	0.59	0.66	31.9
Approach		163	3.5	0.191	8.3	LOS A	1.1	27.7	0.59	0.65	31.5
All Vehicles		1370	3.8	0.381	7.3	LOS A	2.6	67.6	0.54	0.56	31.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

D8

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2014
Analysis Time Period: AM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 Single Lane Roundabout + Turn Lanes
East/West Street: SR 162
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	75	480	105	40	225	130	165	355	30	145	195	40
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			1			1			0			1
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	85	543	119	45	254	147	187	401	34	164	220	45
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1		1	1		1	1			1		1

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	429	673	792	486
Exit. Flow	741	441	486	265

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		628	119		299	147		622			384	45
Entry Cap.		736	867		577	695		512			695	727
Volume (vph)		604	114		288	141		598			369	43
Cap. (vph)		708	834		555	668		492			668	699

v/c Ratio	0.85	0.14	0.52	0.21	1.22		0.55	0.06
Critical Lane	*		*		*		*	
Lane Delay	31.5	5.7	15.8	7.9	140.6		14.6	5.8
Lane LOS	D		C		F		B	
95 % Queue	9.9	0.5	3.0	0.8	23.0		3.4	0.2
Approach:								
Delay	27.36		13.22		140.55		13.69	
LOS	D		B		F		B	

Intersection Delay 53.32 Intersection LOS F

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: PM Peak
Intersection:
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 Single Lane Roundabout + Turn Lanes
East/West Street:
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	55	290	65	25	485	115	45	155	25	240	345	70
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			LTR			LTR		
RT Bypass			1			1			0			1
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	62	328	73	28	548	130	51	175	28	271	390	79
No. Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cnfl. Lanes	1		1	1		1	1			1		1

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	689	288	661	627
Exit. Flow	627	599	237	418

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		390	73		576	130		254			661	79
Entry Cap.		567	744		847	892		583			604	621
Volume (vph)		375	70		554	125		244			636	76
Cap. (vph)		545	715		814	858		561			581	597

D11

v/c Ratio	0.69	0.10	0.68	0.15	0.44		1.09	0.13
Critical Lane	*		*		*		*	
Lane Delay	23.4	6.1	16.7	5.6	13.4		91.5	7.5
Lane LOS	C		C		B		F	
95 % Queue	5.3	0.3	5.5	0.5	2.2		19.2	0.4
Approach:								
Delay	20.64		14.66		13.45		82.51	
LOS	C		B		B		F	

Intersection Delay 39.02 Intersection LOS E

D12

MOVEMENT SUMMARY

Site: 1-Lane 2038 AM + Turn Lane - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	43	4.0	0.317	15.8	LOS B	2.6	66.1	0.84	0.87	29.6
6	T	245	4.0	0.317	7.1	LOS A	2.6	66.1	0.84	0.64	30.8
16	R	141	4.0	0.127	6.9	LOS A	0.9	22.2	0.64	0.58	31.6
Approach		429	4.0	0.317	7.9	LOS A	2.6	66.1	0.78	0.65	30.9
North East: State Route 81											
7	L	158	3.5	0.318	14.6	LOS B	2.3	58.2	0.67	0.82	29.6
4	T	212	3.5	0.318	5.9	LOS A	2.3	58.2	0.67	0.55	31.3
14	R	43	3.5	0.036	6.5	LOS A	0.2	5.4	0.53	0.52	32.1
Approach		413	3.5	0.318	9.3	LOS A	2.3	58.2	0.65	0.65	30.7
North West: State Route 162											
5	L	82	4.0	0.504	14.8	LOS B	4.1	106.8	0.73	0.86	30.0
2	T	522	4.0	0.504	6.1	LOS A	4.1	106.8	0.73	0.55	31.4
12	R	114	4.0	0.084	5.9	LOS A	0.5	12.5	0.42	0.49	32.6
Approach		717	4.0	0.504	7.0	LOS A	4.1	106.8	0.68	0.58	31.4
South West: State Route 81											
3	L	179	3.5	0.913	42.5	LOS D	18.8	482.8	1.00	1.53	19.5
8	T	386	3.5	0.913	33.8	LOS C	18.8	482.8	1.00	1.53	19.9
18	R	33	3.5	0.913	35.4	LOS D	18.8	482.8	1.00	1.53	19.8
Approach		598	3.5	0.913	36.5	LOS D	18.8	482.8	1.00	1.53	19.7
All Vehicles		2158	3.8	0.913	15.8	LOS B	18.8	482.8	0.78	0.87	26.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2038 AM + Turn Lane

1.2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	43	4.0	0.346	16.0	LOS B	2.6	68.2	0.83	0.89	29.5
6	T	245	4.0	0.346	7.3	LOS A	2.6	68.2	0.83	0.66	30.9
16	R	141	4.0	0.141	7.0	LOS A	0.9	23.3	0.63	0.60	31.6
Approach		429	4.0	0.346	8.1	LOS A	2.6	68.2	0.76	0.67	30.9
North East: State Route 81											
7	L	158	3.5	0.356	15.0	LOS B	2.5	64.1	0.68	0.84	29.5
4	T	212	3.5	0.356	6.3	LOS A	2.5	64.1	0.68	0.58	31.2
14	R	43	3.5	0.040	6.7	LOS A	0.2	5.8	0.53	0.53	32.1
Approach		413	3.5	0.356	9.6	LOS A	2.5	64.1	0.67	0.67	30.6
North West: State Route 162											
5	L	82	4.0	0.567	15.9	LOS B	5.2	134.1	0.78	0.90	29.5
2	T	522	4.0	0.567	7.2	LOS A	5.2	134.1	0.78	0.68	31.2
12	R	114	4.0	0.094	6.0	LOS A	0.5	13.7	0.44	0.50	32.6
Approach		717	4.0	0.567	8.0	LOS A	5.2	134.1	0.73	0.67	31.2
South West: State Route 81											
3	L	179	3.5	1.067	81.6	LOS F	33.8	868.4	1.00	2.06	13.0
8	T	386	3.5	1.067	72.9	LOS E	33.8	868.4	1.00	2.06	12.7
18	R	33	3.5	1.067	74.5	LOS E	33.8	868.4	1.00	2.06	12.6
Approach		598	3.5	1.067	75.6	LOS E	33.8	868.4	1.00	2.06	12.8
All Vehicles		2158	3.8	1.067	27.1	LOS C	33.8	868.4	0.80	1.06	22.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2038 PM + Turn Lane - EF1.1

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	27	4.0	0.415	13.8	LOS B	3.2	81.7	0.57	0.87	30.5
6	T	527	4.0	0.415	5.1	LOS A	3.2	81.7	0.57	0.46	32.5
16	R	125	4.0	0.091	5.8	LOS A	0.5	13.5	0.40	0.48	32.8
Approach		679	4.0	0.415	5.6	LOS A	3.2	81.7	0.54	0.48	32.4
North East: State Route 81											
7	L	261	3.5	0.616	18.2	LOS B	6.8	174.3	0.90	0.97	27.9
4	T	375	3.5	0.616	9.5	LOS A	6.8	174.3	0.90	0.90	30.0
14	R	76	3.5	0.072	7.4	LOS A	0.5	11.9	0.65	0.60	31.5
Approach		712	3.5	0.616	12.5	LOS B	6.8	174.3	0.87	0.90	29.3
North West: State Route 162											
5	L	60	4.0	0.420	16.1	LOS B	3.6	92.3	0.89	0.88	29.5
2	T	315	4.0	0.420	7.4	LOS A	3.6	92.3	0.89	0.68	30.5
12	R	71	4.0	0.060	6.4	LOS A	0.4	9.8	0.56	0.54	31.9
Approach		446	4.0	0.420	8.4	LOS A	3.6	92.3	0.84	0.68	30.5
South West: State Route 81											
3	L	49	3.5	0.320	16.7	LOS B	2.2	55.5	0.78	0.92	28.8
8	T	168	3.5	0.320	8.0	LOS A	2.2	55.5	0.78	0.73	31.0
18	R	27	3.5	0.320	9.6	LOS A	2.2	55.5	0.78	0.80	31.1
Approach		245	3.5	0.320	9.9	LOS A	2.2	55.5	0.78	0.77	30.5
All Vehicles		2082	3.8	0.616	9.1	LOS A	6.8	174.3	0.75	0.70	30.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 1-Lane 2038 PM + Turn Lane

1,2

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
1	L	27	4.0	0.437	13.9	LOS B	3.4	86.6	0.59	0.87	30.6
6	T	527	4.0	0.437	5.0	LOS A	3.4	86.6	0.59	0.45	32.5
16	R	125	4.0	0.096	5.3	LOS A	0.5	14.1	0.41	0.46	33.0
Approach		679	4.0	0.437	5.4	LOS A	3.4	86.6	0.56	0.47	32.5
North East: State Route 81											
7	L	261	3.5	0.659	19.5	LOS B	7.8	199.5	0.93	1.01	27.5
4	T	375	3.5	0.659	10.5	LOS B	7.8	199.5	0.93	0.97	29.9
14	R	76	3.5	0.077	7.0	LOS A	0.5	12.5	0.66	0.60	31.7
Approach		712	3.5	0.659	13.4	LOS B	7.8	199.5	0.90	0.95	29.1
North West: State Route 162											
5	L	60	4.0	0.452	16.6	LOS B	3.9	100.4	0.91	0.91	29.4
2	T	315	4.0	0.452	7.7	LOS A	3.9	100.4	0.91	0.72	30.5
12	R	71	4.0	0.064	6.0	LOS A	0.4	10.3	0.57	0.52	32.2
Approach		446	4.0	0.452	8.6	LOS A	3.9	100.4	0.86	0.71	30.6
South West: State Route 81											
3	L	49	3.5	0.346	17.1	LOS B	2.3	59.3	0.79	0.93	28.8
8	T	168	3.5	0.346	8.2	LOS A	2.3	59.3	0.79	0.75	31.0
18	R	27	3.5	0.346	9.5	LOS A	2.3	59.3	0.79	0.81	31.2
Approach		245	3.5	0.346	10.1	LOS B	2.3	59.3	0.79	0.79	30.5
All Vehicles		2082	3.8	0.659	9.4	LOS A	7.8	199.5	0.77	0.72	30.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

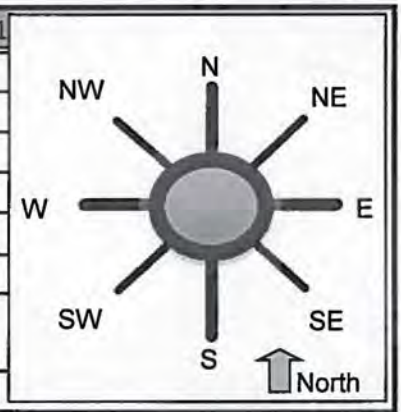
Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2018 AM Peak
County/District:	D2 - Newton County
Intersection Name:	SR81 @ SR162 SINGLE LANE + TURN LANES



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph						230		50
	E (3), vph								
	SE (4), vph		95				20		315
	S (5), vph								
	SW (6), vph		130		30				
	W (7), vph								
	NW (8), vph				145		110		
Output	Total Vehicles	0	225	0	175	0	360	0	365

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	0	0	260	0	57
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	107	0	0	0	23	0	356
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	147	0	34	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	0	0	164	0	124	0	0
Entry flow, pcu/h	0	254	0	198	0	407	0	413
Conflicting flow, pcu/h	0	322	0	441	0	520	0	288

Roundabout Type	Standard Single Lane or Urban Compact

D17

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness								
HCM 2010 Model (build)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	787	NA	699	NA	646	NA	814
Entry Flow Rates, vph	NA	245	NA	190	NA	391	NA	397
V/C ratio		**0.31**		**0.27**		**0.61**		**0.49**
Control Delay, s/veh		**8**		**8**		**17**		**11**
LOS		A		A		C		B
95th % Queue (ft)		**34**		**29**		**106**		**70**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	991	NA	901	NA	846	NA	1018
Entry Flow Rates, vph	NA	245	NA	190	NA	391	NA	397
V/C ratio		**0.26**		**0.22**		**0.48**		**0.41**
Control Delay, sec/pcu		**6**		**6**		**11**		**8**
LOS		A		A		B		A
95th % Queue (ft)		**27**		**22**		**69**		**52**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)						
Bypass Characteristics	**Bypass #1**	**Bypass #2**	**Bypass #3**	**Bypass #4**	**Bypass #5**	**Bypass #6**
Select Entry Leg from Bypass (FROM)	NE (2)	W (7)	SE (4)			
Select Exit Leg for Bypass (TO)	NW (8)	SW (6)	NE (2)			
Does the bypass have a dedicated receiving lane?	Yes	Yes	Yes			
Volumes						
Right Turn Volume removed from Entry Leg	25	70	80			
Volume Characteristics (for entry leg)						
PHF	0.92	0.92	0.92			
F_{HV}	0.96	1.00	0.96			
F_{ped}	1.00	1.00	1.00			
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr	28	76	90			
Conflicting Flow, pcu/hr	0	0	0			
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph	1087	1130	1087			
Flow Rates of Exiting Traffic, vph	27	76	87			
V/C ratio	**0.03**	**0.07**	**0.08**			
Control Delay, s/veh	**0.0**	**0.0**	**0.0**			
LOS	A	A	A			

95th % Queue (ft)	**2**	**5**	**7**			
Approach w/Bypass Delay, s/veh	*7.4*		*6*			
Approach w/Bypass LOS	*A*		*A*			

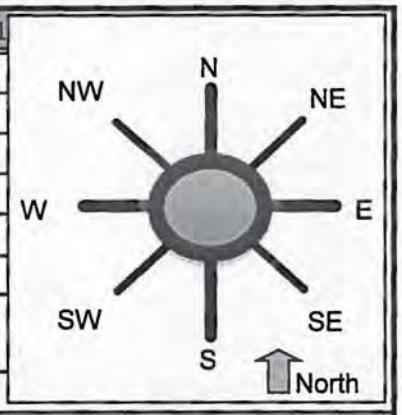
Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information

v2.1

Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2018 PM Peak
County/District:	D2 - Newton County
Intersection Name:	SR 81 @ SR162 Single Lane + TURN LANES



Volumes

		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph								
Exit	NE (2), vph						105		35
Legs	E (3), vph								
(TO)	SE (4), vph		155				15		190
	S (5), vph								
	SW (6), vph		235		15				
	W (7), vph								
	NW (8), vph				315		30		
Output	Total Vehicles	0	390	0	330	0	150	0	225

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	0	0	119	0	40
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	175	0	0	0	17	0	215
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	266	0	17	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	0	0	356	0	34	0	0
Entry flow, pcu/h	0	441	0	373	0	170	0	254
Conflicting flow, pcu/h	0	407	0	192	0	430	0	458

Roundabout Type	Standard Single Lane or Urban Compact

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	NA	723	NA	897	NA	707	NA	687
Entry Flow Rates, vph	NA	424	NA	359	NA	163	NA	245
V/C ratio		**0.59**		**0.40**		**0.23**		**0.36**
Control Delay, s/veh		**15**		**9**		**8**		**10**
LOS		B		A		A		A
95th % Queue (ft)		**100**		**51**		**23**		**42**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	926	NA	1099	NA	909	NA	889
Entry Flow Rates, vph	NA	424	NA	359	NA	163	NA	245
V/C ratio		**0.48**		**0.34**		**0.19**		**0.29**
Control Delay, sec/pcu		**10**		**7**		**6**		**7**
LOS		A		A		A		A
95th % Queue (ft)		**68**		**39**		**18**		**31**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)

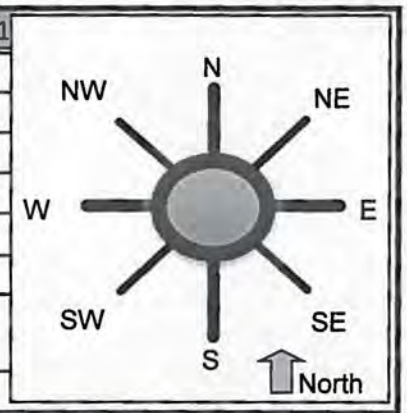
Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)	NE (2)	NW (8)	SE (4)			
Select Exit Leg for Bypass (TO)	NW (8)	SW (6)	NE (2)			
Does the bypass have a dedicated receiving lane?	Yes	Yes	Yes			
Volumes						
Right Turn Volume removed from Entry Leg	45	45	75			
Volume Characteristics (for entry leg)						
PHF	0.92	0.92	0.92			
F_{HV}	0.96	0.96	0.96			
F_{ped}	1.00	1.00	1.00			
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr	51	51	85			
Conflicting Flow, pcu/hr	0	0	0			
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph	1087	1087	1087			
Flow Rates of Exiting Traffic, vph	49	49	82			
V/C ratio	**0.05**	**0.05**	**0.08**			
Control Delay, s/veh	**0.0**	**0.0**	**0.0**			
LOS	A	A	A			

95th % Queue (ft)	**4**	**4**	**7**			
Approach w/Bypass Delay, s/veh	***13.2***	***8.2***	***7***			
Approach w/Bypass LOS	*B*	*A*	*A*			

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2038 AM Peak
County/District:	D2 - Newton County
Intersection Name:	SR81 @ SR162 SINGLE LANES + TURN LANES



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph						355		75
	E (3), vph								
	SE (4), vph		145				30		480
	S (5), vph								
	SW (6), vph		195		40				
	W (7), vph								
	NW (8), vph				225		165		
Output	Total Vehicles	0	340	0	265	0	550	0	555

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	0	0	401	0	85
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	164	0	0	0	34	0	543
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	220	0	45	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	0	0	254	0	187	0	0
Entry flow, pcu/h	0	384	0	300	0	622	0	627
Conflicting flow, pcu/h	0	486	0	673	0	791	0	430

Roundabout Type	Standard Single Lane or Urban Compact

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	NA	668	NA	555	NA	492	NA	707
Entry Flow Rates, vph	NA	370	NA	288	NA	598	NA	603
V/C ratio		**0.55**		**0.52**		**1.21**		**0.85**
Control Delay, s/veh		**15**		**16**		**140**		**32**
LOS		B		C		F		D
95th % Queue (ft)		**88**		**77**		**596**		**257**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	869	NA	748	NA	681	NA	909
Entry Flow Rates, vph	NA	370	NA	288	NA	598	NA	603
V/C ratio		**0.44**		**0.40**		**0.91**		**0.69**
Control Delay, sec/pcu		**10**		**10**		**41**		**16**
LOS		A		A		E		C
95th % Queue (ft)		**60**		**50**		**313**		**149**

Notes:

v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)

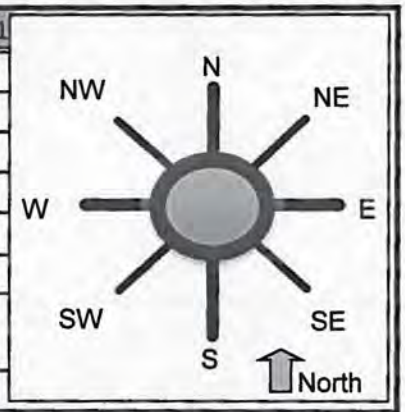
Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)	NE (2)	SE (4)	NW (8)			
Select Exit Leg for Bypass (TO)	NW (8)	NE (2)	SW (6)			
Does the bypass have a dedicated receiving lane?	Yes	Yes				
Volumes						
Right Turn Volume removed from Entry Leg	40	130	105			
Volume Characteristics (for entry leg)						
PHF	0.92	0.92	0.92			
F_{HV}	0.96	0.96	0.96			
F_{ped}	1.00	1.00	1.00			
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr	45	147	119			
Conflicting Flow, pcu/hr	0	0	266			
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph	1087	1087	833			
Flow Rates of Exiting Traffic, vph	43	141	114			
V/C ratio	**0.04**	**0.14**	**0.14**			
Control Delay, s/veh	**0.0**	**0.0**	**5.8**			
LOS	A	A	A			

95th % Queue (ft)	**3**	**12**	**13**			
Approach w/Bypass Delay, s/veh	***13.1***	***10.7***	***27***			
Approach w/Bypass LOS	*B*	*B*	*D*			

Roundabout Analysis Tool
Single Lane

3/5/2015
Version 2.1

General & Site Information	v2.1
Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2038 PM Peak
County/District:	D2 - Newton County
Intersection Name:	SR 81 @ SR162 Single Lane + Turn Lanes



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph						155		55
	E (3), vph								
	SE (4), vph		240				25		290
	S (5), vph								
	SW (6), vph		345		25				
	W (7), vph								
	NW (8), vph				485		45		
Output	Total Vehicles	0	585	0	510	0	225	0	345

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	96%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	1.000	0.962	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	0	0	175	0	62
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	271	0	0	0	28	0	328
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	390	0	28	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	0	0	548	0	51	0	0
Entry flow, pcu/h	0	661	0	577	0	254	0	390
Conflicting flow, pcu/h	0	627	0	288	0	661	0	690

Roundabout Type	Standard Single Lane or Urban Compact

Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness								
HCM 2010 Model (build)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	580	NA	814	NA	561	NA	545
Entry Flow Rates, vph	NA	636	NA	554	NA	245	NA	375
V/C ratio		**1.10**		**0.68**		**0.44**		**0.69**
Control Delay, s/veh		**92**		**17**		**13**		**23**
LOS		F		C		B		C
95th % Queue (ft)		**502**		**142**		**57**		**138**
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	NA	776	NA	1018	NA	755	NA	738
Entry Flow Rates, vph	NA	636	NA	554	NA	245	NA	375
V/C ratio		**0.85**		**0.57**		**0.34**		**0.53**
Control Delay, sec/pcu		**29**		**11**		**9**		**13**
LOS		D		B		A		B
95th % Queue (ft)		**264**		**96**		**39**		**81**

Notes: v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)						
Bypass Characteristics	**Bypass #1**	**Bypass #2**	**Bypass #3**	**Bypass #4**	**Bypass #5**	**Bypass #6**
Select Entry Leg from Bypass (FROM)	NE (2)	SE (4)	W (7)			
Select Exit Leg for Bypass (TO)	NW (8)	NE (2)	SW (6)			
Does the bypass have a dedicated receiving lane?	Yes	Yes	Yes			
Volumes						
Right Turn Volume removed from Entry Leg	70	115	65			
Volume Characteristics (for entry leg)						
PHF	0.92	0.92	0.92			
F_{HV}	0.96	0.96	1.00			
F_{ped}	1.00	1.00	1.00			
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr	79	130	71			
Conflicting Flow, pcu/hr	0	0	0			
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph	1087	1087	1130			
Flow Rates of Exiting Traffic, vph	76	125	71			
V/C ratio	**0.07**	**0.12**	**0.06**			
Control Delay, s/veh	**0.0**	**0.0**	**0.0**			
LOS	A	A	A			

95th % Queue (ft)	**6**	**11**	**5**			
Approach w/Bypass Delay, s/veh	***82.3***	***13.6***				
Approach w/Bypass LOS	*F*	*B*				

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period:
Intersection: SR 71 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year:
Project ID: 0009919 Two Lane Roundabout
East/West Street:
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	50	315	70	30	145	80	0	230		95	130	
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			L	T		L	T	
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	57	356	79	34	164	90	0	260	0	107	147	0
No. Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Cnfl. Lanes	1			1			2			2		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	288	317	520	198
Exit. Flow	463	164	407	260

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	Left	Right BP	Left	Right BP	Left	Right BP	Left	Right BP
Entry Flow		492		288	0	260	107	254
Entry Cap.		847		823	765	785	974	984
Volume (vph)		473		277	0	250	103	244
Cap. (vph)		814		791	736	755	937	946

E1

v/c Ratio	0.58	0.35	0.00	0.33	0.11	0.26
Critical Lane	*	*		*		*
Lane Delay	13.3	8.7	4.9	8.8	4.9	6.4
Lane LOS	B	A	A	A	A	A
95 % Queue	3.8	1.6	0.0	1.5	0.4	1.0
Approach:						
Delay	13.28	8.73		8.77		5.96
LOS	B	A		A		A

Intersection Delay 9.62 Intersection LOS A

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: PM Peak
Intersection: SR 71 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2018
Project ID: 0009919 Two Lane Roundabout
East/West Street: SR 162
North/South Street: SR 81

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	190		15	315	75	30	105		155	235	
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			L	T		L	T	
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	40	215	0	17	356	85	34	119	0	175	266	0
No. Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Cnfl. Lanes	1			1			2			2		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	458	193	430	407
Exit. Flow	390	390	244	283

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		255			458		34	153		175	441	
Entry Cap.		715			932		819	836		833	850	
Volume (vph)		245			440		33	147		168	424	
Cap. (vph)		688			896		788	804		801	817	

E3

v/c Ratio	0.36	0.49	0.04	0.18	0.21	0.52
Critical Lane	*	*		*		*
Lane Delay	9.9	10.3	5.0	6.4	6.7	11.7
Lane LOS	A	B	A	A	A	B
95 % Queue	1.6	2.8	0.1	0.7	0.8	3.0
Approach:						
Delay	9.88	10.30		6.13		10.26
LOS	A	B		A		B

Intersection Delay 9.70 Intersection LOS A

E4

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2018 AM EF1.1

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	16	4.0	0.437	13.6	LOS B	2.6	67.5	0.46	0.85	29.9
8X	T	342	4.0	0.437	6.5	LOS A	2.6	67.5	0.46	0.54	32.2
18X	R	82	4.0	0.437	7.5	LOS A	2.6	67.5	0.46	0.62	32.0
Approach		440	4.0	0.437	7.0	LOS A	2.6	67.5	0.46	0.57	32.1
North East: State Route 81											
1X	L	168	3.5	0.188	14.7	LOS B	1.1	27.5	0.58	0.75	28.4
6X	T	255	3.5	0.268	7.2	LOS A	1.7	44.2	0.59	0.60	31.6
16X	R	49	3.5	0.268	8.5	LOS A	1.7	44.2	0.59	0.68	31.5
Approach		473	3.5	0.268	10.0	LOS B	1.7	44.2	0.58	0.66	30.3
North West: State Route 162											
7X	L	38	4.0	0.377	14.9	LOS B	1.9	48.5	0.60	0.93	29.2
4X	T	207	4.0	0.377	7.8	LOS A	1.9	48.5	0.60	0.65	31.4
14X	R	49	4.0	0.377	8.8	LOS A	1.9	48.5	0.60	0.72	31.4
Approach		293	4.0	0.377	8.9	LOS A	1.9	48.5	0.60	0.70	31.1
South West: State Route 81											
5X	L	33	3.5	0.045	15.3	LOS B	0.2	5.8	0.56	0.72	28.4
2X	T	114	3.5	0.116	7.0	LOS A	0.7	17.1	0.54	0.58	31.9
12X	R	16	3.5	0.116	8.3	LOS A	0.7	17.1	0.54	0.64	31.7
Approach		163	3.5	0.116	8.8	LOS A	0.7	17.1	0.54	0.61	31.0
All Vehicles		1370	3.8	0.437	8.6	LOS A	2.6	67.5	0.54	0.63	31.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

ES

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2018 AM EF1.2

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	33	4.0	0.244	15.0	LOS B	1.1	28.6	0.56	0.89	28.9
8X	T	49	4.0	0.244	7.9	LOS A	1.1	28.6	0.56	0.66	31.4
18X	R	87	4.0	0.244	8.9	LOS A	1.1	28.6	0.56	0.73	31.3
Approach		168	4.0	0.244	9.8	LOS A	1.1	28.6	0.56	0.74	30.8
North East: State Route 81											
1X	L	103	3.5	0.102	13.5	LOS B	0.5	13.7	0.40	0.67	28.9
6X	T	141	3.5	0.142	6.2	LOS A	0.8	20.2	0.40	0.50	32.6
16X	R	27	3.5	0.142	7.5	LOS A	0.8	20.2	0.40	0.58	32.2
Approach		272	3.5	0.142	9.1	LOS A	0.8	20.2	0.40	0.57	31.0
North West: State Route 162											
7X	L	54	4.0	0.575	15.5	LOS B	4.0	102.9	0.62	0.92	28.9
4X	T	342	4.0	0.575	8.4	LOS A	4.0	102.9	0.62	0.72	31.3
14X	R	76	4.0	0.575	9.5	LOS A	4.0	102.9	0.62	0.77	31.3
Approach		473	4.0	0.575	9.4	LOS A	4.0	102.9	0.62	0.75	31.0
South West: State Route 81											
5X	L	120	3.5	0.177	16.2	LOS B	1.0	25.3	0.66	0.81	27.9
2X	T	250	3.5	0.298	8.3	LOS A	2.0	50.2	0.69	0.70	31.1
12X	R	22	3.5	0.298	9.6	LOS A	2.0	50.2	0.69	0.75	31.2
Approach		391	3.5	0.298	10.8	LOS B	2.0	50.2	0.68	0.73	30.0
All Vehicles		1304	3.7	0.575	9.8	LOS A	4.0	102.9	0.59	0.71	30.7

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

E6

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2018 PM EF1.1

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	16	4.0	0.437	13.6	LOS B	2.6	67.5	0.46	0.85	29.9
8X	T	342	4.0	0.437	6.5	LOS A	2.6	67.5	0.46	0.54	32.2
18X	R	82	4.0	0.437	7.5	LOS A	2.6	67.5	0.46	0.62	32.0
Approach		440	4.0	0.437	7.0	LOS A	2.6	67.5	0.46	0.57	32.1
North East: State Route 81											
1X	L	168	3.5	0.188	14.7	LOS B	1.1	27.5	0.58	0.75	28.4
6X	T	255	3.5	0.268	7.2	LOS A	1.7	44.2	0.59	0.60	31.6
16X	R	49	3.5	0.268	8.5	LOS A	1.7	44.2	0.59	0.68	31.5
Approach		473	3.5	0.268	10.0	LOS B	1.7	44.2	0.58	0.66	30.3
North West: State Route 162											
7X	L	38	4.0	0.377	14.9	LOS B	1.9	48.5	0.60	0.93	29.2
4X	T	207	4.0	0.377	7.8	LOS A	1.9	48.5	0.60	0.65	31.4
14X	R	49	4.0	0.377	8.8	LOS A	1.9	48.5	0.60	0.72	31.4
Approach		293	4.0	0.377	8.9	LOS A	1.9	48.5	0.60	0.70	31.1
South West: State Route 81											
5X	L	33	3.5	0.045	15.3	LOS B	0.2	5.8	0.56	0.72	28.4
2X	T	114	3.5	0.116	7.0	LOS A	0.7	17.1	0.54	0.58	31.9
12X	R	16	3.5	0.116	8.3	LOS A	0.7	17.1	0.54	0.64	31.7
Approach		163	3.5	0.116	8.8	LOS A	0.7	17.1	0.54	0.61	31.0
All Vehicles		1370	3.8	0.437	8.6	LOS A	2.6	67.5	0.54	0.63	31.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2018 PM EF1.2

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	16	4.0	0.482	13.9	LOS B	3.0	77.3	0.50	0.85	29.7
8X	T	342	4.0	0.482	6.8	LOS A	3.0	77.3	0.50	0.57	32.0
18X	R	82	4.0	0.482	7.9	LOS A	3.0	77.3	0.50	0.64	31.8
Approach		440	4.0	0.482	7.3	LOS A	3.0	77.3	0.50	0.59	31.9
North East: State Route 81											
1X	L	168	3.5	0.208	15.1	LOS B	1.2	30.3	0.60	0.77	28.4
6X	T	255	3.5	0.302	7.6	LOS A	1.9	49.9	0.62	0.63	31.4
16X	R	49	3.5	0.302	8.8	LOS A	1.9	49.9	0.62	0.70	31.4
Approach		473	3.5	0.302	10.4	LOS B	1.9	49.9	0.61	0.69	30.2
North West: State Route 162											
7X	L	38	4.0	0.429	15.8	LOS B	2.3	58.9	0.63	0.98	28.7
4X	T	207	4.0	0.429	8.7	LOS A	2.3	58.9	0.63	0.74	31.2
14X	R	49	4.0	0.429	9.8	LOS A	2.3	58.9	0.63	0.82	31.2
Approach		293	4.0	0.429	9.8	LOS A	2.3	58.9	0.63	0.79	30.9
South West: State Route 81											
5X	L	33	3.5	0.055	16.1	LOS B	0.3	6.8	0.58	0.74	27.9
2X	T	114	3.5	0.131	7.3	LOS A	0.7	19.0	0.56	0.60	31.8
12X	R	16	3.5	0.131	8.6	LOS A	0.7	19.0	0.56	0.66	31.6
Approach		163	3.5	0.131	9.2	LOS A	0.7	19.0	0.56	0.63	30.8
All Vehicles		1370	3.8	0.482	9.1	LOS A	3.0	77.3	0.57	0.67	30.9

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

E8

Phone:
E-Mail:
Fax:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: AM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 Two Lane Roundabout
East/West Street: SR 162
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	75	480	105	40	225	130	165	355		145	195	
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			L	T		L	T	
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	85	543	119	45	254	147	187	401	0	164	220	0
No. Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Cnfl. Lanes	1			1			2			2		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	429	673	792	486
Exit. Flow	707	441	633	384

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		747			446		187	588		164	384	
Entry Cap.		736			577		624	649		785	804	
Volume (vph)		718			429		180	565		158	369	
Cap. (vph)		708			555		600	624		755	773	

v/c Ratio	1.01	0.77	0.30	0.91	0.21	0.48
Critical Lane	*	*		*		*
Lane Delay	61.6	29.0	10.0	42.1	7.1	11.2
Lane LOS	F	D	B	E	A	B
95 % Queue	17.1	7.0	1.3	11.4	0.8	2.6
Approach:						
Delay	61.64	29.00		34.33		9.98
LOS	F	D		D		A

Intersection Delay 36.19 Intersection LOS E

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: Todd Price
Agency/Co.: GADOT
Date Performed: 10/15/2013
Analysis Time Period: PM Peak
Intersection: SR 81 @ SR 162
Jurisdiction: D2
Units: U. S. Customary
Analysis Year: 2038
Project ID: 0009919 Dual Lane Roundabout
East/West Street:
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	55	290	65	25	485	115	45	155		240	345	
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR			LTR			L	T		L	T	
RT Bypass			0			0			0			0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	4	4	4	4	4	4	4	4	4	4	4	4
NumPeds	0			0			0			0		
U-Turn PHF	1.00			1.00			1.00			1.00		
U-Turn %HV	3			3			3			3		
Flow Rate	62	328	73	28	548	130	51	175	0	271	390	0
No. Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Cnfl. Lanes	1			1			2			2		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound		Westbound		Northbound		Southbound	
Crit. Hdwy	5.1929	5.1929	5.1929		5.1929	5.1929	5.1929	
Flup. Hdwy	3.1858	3.1858	3.1858		3.1858	3.1858	3.1858	

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	689	288	661	627
Exit. Flow	599	599	367	491

Capacity and Level of Service

	Eastbound			Westbound			Northbound			Southbound		
	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		463			706		51	226		271	661	
Entry Cap.		567			847		688	711		706	729	
Volume (vph)		445			679		49	217		261	636	
Cap. (vph)		545			814		662	684		679	701	

E11

v/c Ratio	0.82	0.83	0.07	0.32	0.38	0.91
Critical Lane	*	*		*		*
Lane Delay	33.7	26.5	6.2	9.3	10.5	39.0
Lane LOS	D	D	A	A	B	E
95 % Queue	8.1	9.6	0.2	1.4	1.8	11.9
Approach:						
Delay	33.72	26.51		8.72		30.72
LOS	D	D		A		D

Intersection Delay 27.50 Intersection LOS D

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2038 AM
EF1.1

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	43	4.0	0.675	19.6	LOS B	5.4	138.5	0.85	1.09	26.9
8X	T	245	4.0	0.675	12.5	LOS B	5.4	138.5	0.85	1.01	29.1
18X	R	141	4.0	0.675	13.5	LOS B	5.4	138.5	0.85	1.03	28.9
Approach		429	4.0	0.675	13.5	LOS B	5.4	138.5	0.85	1.02	28.8
North East: State Route 81											
1X	L	158	3.5	0.187	15.2	LOS B	1.1	28.5	0.64	0.77	28.3
6X	T	212	3.5	0.241	7.6	LOS A	1.6	40.8	0.64	0.63	31.3
16X	R	43	3.5	0.241	8.8	LOS A	1.6	40.8	0.64	0.70	31.3
Approach		413	3.5	0.241	10.6	LOS B	1.6	40.8	0.64	0.69	30.0
North West: State Route 162											
7X	L	82	4.0	0.879	23.2	LOS C	12.8	330.0	0.98	1.21	25.4
4X	T	522	4.0	0.879	16.1	LOS B	12.8	330.0	0.98	1.20	27.1
14X	R	114	4.0	0.879	17.1	LOS B	12.8	330.0	0.98	1.20	27.0
Approach		717	4.0	0.879	17.1	LOS B	12.8	330.0	0.98	1.20	26.8
South West: State Route 81											
5X	L	179	3.5	0.338	18.6	LOS B	2.3	59.7	0.88	0.93	26.6
2X	T	386	3.5	0.571	13.3	LOS B	5.9	152.2	0.99	1.02	28.9
12X	R	33	3.5	0.571	14.5	LOS B	5.9	152.2	0.99	1.02	28.8
Approach		598	3.5	0.571	14.9	LOS B	5.9	152.2	0.96	0.99	28.1
All Vehicles		2158	3.8	0.879	14.5	LOS B	12.8	330.0	0.88	1.01	28.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2038 AM
EF1.2

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	43	4.0	0.777	23.5	LOS C	7.1	182.7	0.91	1.16	25.1
8X	T	245	4.0	0.777	16.4	LOS B	7.1	182.7	0.91	1.11	26.8
18X	R	141	4.0	0.777	17.4	LOS B	7.1	182.7	0.91	1.12	26.7
Approach		429	4.0	0.777	17.5	LOS B	7.1	182.7	0.91	1.12	26.6
North East: State Route 81											
1X	L	158	3.5	0.206	15.6	LOS B	1.2	31.1	0.65	0.79	28.2
6X	T	212	3.5	0.275	8.0	LOS A	1.8	45.8	0.67	0.67	31.2
16X	R	43	3.5	0.275	9.3	LOS A	1.8	45.8	0.67	0.73	31.2
Approach		413	3.5	0.275	11.0	LOS B	1.8	45.8	0.66	0.72	29.9
North West: State Route 162											
7X	L	82	4.0	0.991	39.4	LOS D	23.1	596.1	1.00	1.56	19.9
4X	T	522	4.0	0.991	32.3	LOS C	23.1	596.1	1.00	1.56	20.5
14X	R	114	4.0	0.991	33.3	LOS C	23.1	596.1	1.00	1.56	20.4
Approach		717	4.0	0.991	33.3	LOS C	23.1	596.1	1.00	1.56	20.4
South West: State Route 81											
5X	L	179	3.5	0.393	20.4	LOS C	2.7	69.6	0.89	0.99	25.8
2X	T	386	3.5	0.661	16.9	LOS B	7.4	190.5	1.00	1.13	26.8
12X	R	33	3.5	0.661	18.2	LOS B	7.4	190.5	1.00	1.13	26.7
Approach		598	3.5	0.661	18.0	LOS B	7.4	190.5	0.97	1.09	26.5
All Vehicles		2158	3.8	0.991	21.6	LOS C	23.1	596.1	0.91	1.18	24.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2038 PM ER1.1

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	27	4.0	0.733	16.8	LOS B	7.8	201.6	0.78	0.94	28.4
8X	T	527	4.0	0.733	9.8	LOS A	7.8	201.6	0.78	0.82	30.6
18X	R	125	4.0	0.733	10.8	LOS B	7.8	201.6	0.78	0.84	30.8
Approach		679	4.0	0.733	10.2	LOS B	7.8	201.6	0.78	0.83	30.5
North East: State Route 81											
1X	L	261	3.5	0.376	16.9	LOS B	2.6	66.7	0.81	0.88	27.5
6X	T	375	3.5	0.502	9.8	LOS A	4.5	114.4	0.87	0.86	30.2
16X	R	76	3.5	0.502	11.1	LOS B	4.5	114.4	0.87	0.87	30.5
Approach		712	3.5	0.502	12.5	LOS B	4.5	114.4	0.85	0.87	29.2
North West: State Route 162											
7X	L	60	4.0	0.697	19.6	LOS B	5.5	141.2	0.84	1.10	26.9
4X	T	315	4.0	0.697	12.5	LOS B	5.5	141.2	0.84	1.02	29.1
14X	R	71	4.0	0.697	13.6	LOS B	5.5	141.2	0.84	1.03	28.9
Approach		446	4.0	0.697	13.7	LOS B	5.5	141.2	0.84	1.03	28.7
South West: State Route 81											
5X	L	49	3.5	0.084	17.2	LOS B	0.5	11.9	0.70	0.80	27.3
2X	T	168	3.5	0.214	8.6	LOS A	1.5	37.4	0.74	0.72	30.9
12X	R	27	3.5	0.214	9.9	LOS A	1.5	37.4	0.74	0.76	31.0
Approach		245	3.5	0.214	10.5	LOS B	1.5	37.4	0.73	0.74	30.1
All Vehicles		2082	3.8	0.733	11.8	LOS B	7.8	201.6	0.81	0.87	29.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Rou 4-way 1&2-Lane 2038 PM EF1.2

Roundabout with 1 & 2-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 3C-4
Roundabout Guide (TRB 2010) example number: A-3

Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop Queued	Effective Stop Rate per veh	Average Speed mph
South East: State Route 162											
3X	L	27	4.0	0.813	19.6	LOS B	10.7	276.4	0.90	1.01	27.1
8X	T	527	4.0	0.813	12.5	LOS B	10.7	276.4	0.90	0.95	29.2
18X	R	125	4.0	0.813	13.5	LOS B	10.7	276.4	0.90	0.96	29.1
Approach		679	4.0	0.813	13.0	LOS B	10.7	276.4	0.90	0.96	29.1
North East: State Route 81											
1X	L	261	3.5	0.426	18.0	LOS B	3.1	79.2	0.85	0.94	26.9
6X	T	375	3.5	0.586	12.0	LOS B	5.8	149.2	0.93	0.97	29.6
16X	R	76	3.5	0.586	13.3	LOS B	5.8	149.2	0.93	0.98	29.4
Approach		712	3.5	0.586	14.3	LOS B	5.8	149.2	0.90	0.96	28.5
North West: State Route 162											
7X	L	60	4.0	0.809	24.2	LOS C	7.5	194.4	0.92	1.18	24.9
4X	T	315	4.0	0.809	17.1	LOS B	7.5	194.4	0.92	1.13	26.5
14X	R	71	4.0	0.809	18.1	LOS B	7.5	194.4	0.92	1.14	26.4
Approach		446	4.0	0.809	18.2	LOS B	7.5	194.4	0.92	1.14	26.3
South West: State Route 81											
5X	L	49	3.5	0.106	18.6	LOS B	0.6	14.2	0.72	0.85	26.6
2X	T	168	3.5	0.247	9.2	LOS A	1.6	42.0	0.76	0.76	30.8
12X	R	27	3.5	0.247	10.5	LOS B	1.6	42.0	0.76	0.79	30.9
Approach		245	3.5	0.247	11.2	LOS B	1.6	42.0	0.75	0.78	29.8
All Vehicles		2082	3.8	0.813	14.4	LOS B	10.7	276.4	0.88	0.98	28.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Tuesday, June 09, 2015 4:26:34 PM
SIDRA INTERSECTION 5.1.8.2059
Project: c:\users\tprice\documents\projectwise\d0253097\Sidra Model 0009919.sip
8001140, GEORGIA DEPARTMENT OF TRANSPORTATION, FLOATING

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

E16

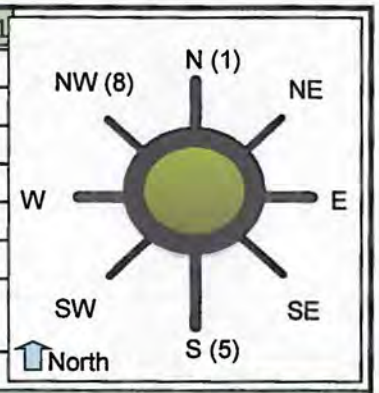
Roundabout Analysis Tool
Multi-Lane

6/10/2015
Version 2.1

General & Site Information

v2.1

Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2018 AM Peak
County/District:	D2 - Newton County
Intersection:	SR 81 @ SR 162 Partial Dual Lane



Volumes

Entry Legs (FROM)

Exit Legs (TO)	N1 (1)	N2 (1)	NE1 (2)	NE2 (2)	E1 (3)	E2 (3)	SE1 (4)	SE2 (4)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
N (1), vph								
NE (2), vph							80	
E (3), vph								
SE (4), vph			95					
S (5), vph								
SW (6), vph				130			30	
W (7), vph								
NW (8), vph			0	25			145	
Entry Volume, vph	0	0	95	155	0	0	255	0

	S1 (5)	S2 (5)	SW1 (6)	SW2 (6)	W1 (7)	W2 (7)	NW1 (8)	NW2 (8)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
N (1), vph								
NE (2), vph				130			50	
E (3), vph								
SE (4), vph				20			315	
S (5), vph								
SW (6), vph							70	
W (7), vph								
NW (8), vph			110					
Entry Volume, vph	0	0	110	150	0	0	435	0

	N	NE	E	SE	S	SW	W	NW
# of Entry Flow Lanes	0	2	0	1	0	2	0	1
# of Conflict Flow Lanes	2	2	2	2	2	2	2	2

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	97%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycles	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{hv}	1.000	0.966	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows		N	NE	E	SE	S	SW	W	NW
Flow to	N (1), pcu/h	0	0	0	0	0	0	0	0
Leg #	NE (2), pcu/h	0	0	0	90	0	147	0	57
	E (3), pcu/h	0	0	0	0	0	0	0	0
	SE (4), pcu/h	0	107	0	0	0	23	0	356
	S (5), pcu/h	0	0	0	0	0	0	0	0
	SW (6), pcu/h	0	146	0	34	0	0	0	79
	W (7), pcu/h	0	0	0	0	0	0	0	0
	NW (8), pcu/h	0	28	0	164	0	124	0	0
	Entry flow, pcu/h	0	281	0	288	0	294	0	492
	Entry flow Lane 1, pcu/h	0	107	0	288	0	124	0	492
	Entry flow Lane 2, pcu/h	0	174	0	0	0	170	0	0
	Conflicting flow, pcu/h	0	322	0	328	0	519	0	287

Results: Approach Measures of Effectiveness

HCM 2010 Model *(build yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								
	NE		**SE**		**SW**		**NW**	
Lane Designations	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	857	871	864	NA	736	755	889	NA
Entry Flow Rates, veh/h	103	168	277	NA	120	163	473	NA
V/C ratio	**0.12**	**0.19**	**0.32**		**0.16**	**0.22**	**0.53**	
Control Delay, sec/pcu	**5.4**	**6.1**	**7.7**		**6.7**	**7.2**	**11.2**	
LOS	A	A	A		A	A	B	
95th % Queue (ft)	**11**	**18**	**36**		**15**	**21**	**84**	
Approach Delay, LOS	5.8 sec, LOS A		7.7 sec, LOS A		6.9 sec, LOS A		11.2 sec, LOS B	

Calibrated Model *(future yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								
	NE		**SE**		**SW**		**NW**	
Lane Designations	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	1148	1186	1174	NA	938	988	1218	NA
Entry Flow Rates, veh/h	103	168	277	NA	120	163	473	NA
V/C ratio	**0.09**	**0.14**	**0.24**		**0.13**	**0.17**	**0.39**	
Control Delay, sec/pcu	**3.9**	**4.2**	**5.2**		**5.0**	**5.2**	**6.8**	
LOS	A	A	A		A	A	A	
95th % Queue (ft)	**8**	**13**	**24**		**11**	**15**	**49**	
Approach Delay, LOS								

v2.1

Bypass Lane Merge Point Analysis (if applicable)

Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
# of Conflicting Exit Flow Lanes	2	2	2	2	2	2
Volumes						
Entry Leg: Insert Right Turn Volume						
Exit Leg: ***(Select Input Method)***						
*Lane Flow in Exit Leg****						
Sum of inner circulatory flow lane to exit leg (leg bypass merges into)	N/A	N/A	N/A	N/A	N/A	N/A
Sum of outer circulatory flow lane to exit leg (leg bypass merges into)	N/A	N/A	N/A	N/A	N/A	N/A
*Critical Lane Flow (Manual) in Exit Leg****						
Volume Characteristics						
PHF (Entry Leg)						
F_{HV} (Entry Leg)						
F_{ped}						
PHF (Exit Leg)***	N/A	N/A	N/A	N/A	N/A	N/A
F_{HV} (Exit Leg)***	N/A	N/A	N/A	N/A	N/A	N/A

******Volume Characteristics are already taken into account for Default method ONLY. Insert Values above if Manual method.***

Entry/Conflicting Flows						
Entry Flow						
Conflicting Critical Flow						
Bypass Lane Results						
Entry Capacity of Bypass, veh/h						
Flow Rates of Exiting Traffic, veh/h						
V/C ratio						
Control Delay, sec/pcu						
LOS						
95th % Queue (ft)						

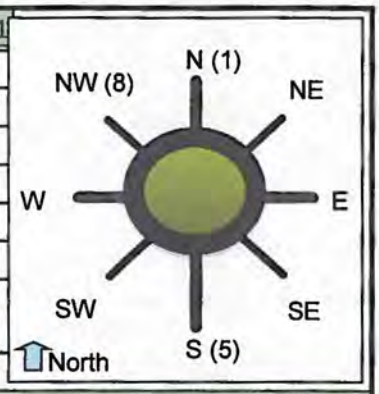
Roundabout Analysis Tool
Multi-Lane

6/10/2015
Version 2.1

General & Site Information

v2.1

Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2018 PM Peak
County/District:	D2 - Newton County
Intersection:	SR 81 @ SR 162 DUAL LANE



Volumes

Entry Legs (FROM)

	N1 (1)	N2 (1)	NE1 (2)	NE2 (2)	E1 (3)	E2 (3)	SE1 (4)	SE2 (4)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
Exit Legs (TO) N (1), vph								
NE (2), vph							75	
E (3), vph								
SE (4), vph			155					
S (5), vph								
SW (6), vph				235			15	
W (7), vph								
NW (8), vph				45			315	
Entry Volume, vph	0	0	155	280	0	0	405	0

	S1 (5)	S2 (5)	SW1 (6)	SW2 (6)	W1 (7)	W2 (7)	NW1 (8)	NW2 (8)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
N (1), vph								
NE (2), vph				105			35	
E (3), vph								
SE (4), vph				15			190	
S (5), vph								
SW (6), vph							45	
W (7), vph								
NW (8), vph			30	0				
Entry Volume, vph	0	0	30	120	0	0	270	0

	N	NE	E	SE	S	SW	W	NW
# of Entry Flow Lanes	0	2	0	1	0	2	0	1
# of Conflict Flow Lanes	2	2	2	2	2	2	2	2

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	97%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycles	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{hv}	1.000	0.966	1.000	0.962	1.000	0.962	1.000	0.962

F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to N (1), pcu/h	0	0	0	0	0	0	0	0
Leg # NE (2), pcu/h	0	0	0	85	0	119	0	40
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	174	0	0	0	17	0	215
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	264	0	17	0	0	0	51
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	51	0	356	0	34	0	0
Entry flow, pcu/h	0	489	0	458	0	170	0	305
Entry flow Lane 1, pcu/h	0	174	0	458	0	34	0	305
Entry flow Lane 2, pcu/h	0	315	0	0	0	136	0	0
Conflicting flow, pcu/h	0	407	0	192	0	429	0	456

Results: Approach Measures of Effectiveness

HCM 2010 Model *(build yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								

	NE		SE		SW		NW	
Lane Designations	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	805	821	950	NA	788	805	790	NA
Entry Flow Rates, veh/h	168	304	440	NA	33	130	293	NA
V/C ratio	**0.21**	**0.37**	**0.46**		**0.04**	**0.16**	**0.37**	
Control Delay, sec/pcu	**6.7**	**8.8**	**9.3**		**5.0**	**6.1**	**9.1**	
LOS	A	A	A		A	A	A	
95th % Queue (ft)	**20**	**45**	**65**		**3**	**15**	**45**	
Approach Delay, LOS	8 sec, LOS A		9.3 sec, LOS A		5.9 sec, LOS A		9.1 sec, LOS A	

Calibrated Model *(future yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								

	NE		SE		SW		NW	
Lane Designations	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	1055	1099	1326	NA	1027	1072	1046	NA
Entry Flow Rates, veh/h	168	304	440	NA	33	130	293	NA
V/C ratio	**0.16**	**0.28**	**0.33**		**0.03**	**0.12**	**0.28**	
Control Delay, sec/pcu	**4.9**	**5.9**	**5.7**		**3.8**	**4.4**	**6.2**	
LOS	A	A	A		A	A	A	

95th % Queue (ft)	15	29	38		3	11	30	
Approach Delay, LOS								

v2.1

Bypass Lane Merge Point Analysis (if applicable)

Bypass Characteristics	**Bypass #1**	**Bypass #2**	**Bypass #3**	**Bypass #4**	**Bypass #5**	**Bypass #6**
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
# of Conflicting Exit Flow Lanes	2	2	2	2	2	2
Volumes						
Entry Leg: Insert Right Turn Volume						
Exit Leg: ***(Select Input Method)***						
*Lane Flow in Exit Leg****						
Sum of inner circulatory flow lane to exit leg (leg bypass merges into)	N/A	N/A	N/A	N/A	N/A	N/A
Sum of outer circulatory flow lane to exit leg (leg bypass merges into)	N/A	N/A	N/A	N/A	N/A	N/A
*Critical Lane Flow (Manual) in Exit Leg****						
Volume Characteristics						
PHF (Entry Leg)						
F_{HV} (Entry Leg)						
F_{ped}						
PHF (Exit Leg)***	N/A	N/A	N/A	N/A	N/A	N/A
F_{HV} (Exit Leg)***	N/A	N/A	N/A	N/A	N/A	N/A
******Volume Characteristics are already taken into account for Default method ONLY. Insert Values above if Manual method.***						
Entry/Conflicting Flows						
Entry Flow						
Conflicting Critical Flow						
Bypass Lane Results						
Entry Capacity of Bypass, veh/h						
Flow Rates of Exiting Traffic, veh/h						
V/C ratio						
Control Delay, sec/pcu						
LOS						
95th % Queue (ft)						

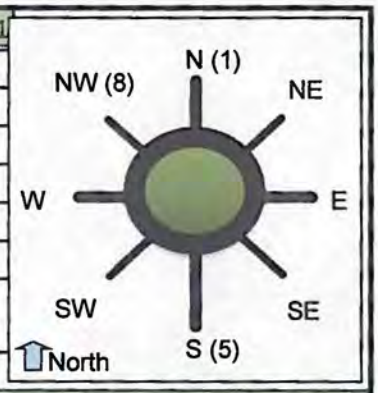
Roundabout Analysis Tool
Multi-Lane

6/10/2015
Version 2.1

General & Site Information

v2.1

Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2038 AM Peak
County/District:	D2 - Newton County
Intersection:	



Volumes

Entry Legs (FROM)

	N1 (1)	N2 (1)	NE1 (2)	NE2 (2)	E1 (3)	E2 (3)	SE1 (4)	SE2 (4)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
Exit Legs (TO) N (1), vph								
NE (2), vph							130	
E (3), vph								
SE (4), vph			145					
S (5), vph								
SW (6), vph				195			40	
W (7), vph								
NW (8), vph				40			226	
Entry Volume, vph	0	0	145	235	0	0	396	0

	S1 (5)	S2 (5)	SW1 (6)	SW2 (6)	W1 (7)	W2 (7)	NW1 (8)	NW2 (8)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
N (1), vph								
NE (2), vph				356			75	
E (3), vph								
SE (4), vph				30			480	
S (5), vph								
SW (6), vph							105	
W (7), vph								
NW (8), vph			165					
Entry Volume, vph	0	0	165	386	0	0	660	0

	N	NE	E	SE	S	SW	W	NW
# of Entry Flow Lanes	0	2	0	1	0	2	0	1
# of Conflict Flow Lanes	2	2	2	2	2	2	2	2

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	97%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycles	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{hv}	1.000	0.966	1.000	0.962	1.000	0.962	1.000	0.962
F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows		N	NE	E	SE	S	SW	W	NW
Flow to	N (1), pcu/h	0	0	0	0	0	0	0	0
Leg #	NE (2), pcu/h	0	0	0	147	0	402	0	85
	E (3), pcu/h	0	0	0	0	0	0	0	0
	SE (4), pcu/h	0	163	0	0	0	34	0	543
	S (5), pcu/h	0	0	0	0	0	0	0	0
	SW (6), pcu/h	0	219	0	45	0	0	0	119
	W (7), pcu/h	0	0	0	0	0	0	0	0
	NW (8), pcu/h	0	45	0	255	0	187	0	0
	Entry flow, pcu/h	0	428	0	448	0	623	0	746
	Entry flow Lane 1, pcu/h	0	163	0	448	0	187	0	746
	Entry flow Lane 2, pcu/h	0	264	0	0	0	436	0	0
	Conflicting flow, pcu/h	0	487	0	674	0	791	0	428

Results: Approach Measures of Effectiveness

HCM 2010 Model *(build yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								

	NE		SE		SW		NW	
Lane Designations	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	758	776	678	NA	601	625	805	NA
Entry Flow Rates, veh/h	158	255	430	NA	179	420	717	NA
V/C ratio	**0.21**	**0.33**	**0.63**		**0.30**	**0.67**	**0.89**	
Control Delay, sec/pcu	**7.0**	**8.5**	**17.2**		**10.0**	**20.1**	**33.3**	
LOS	A	A	C		B	C	D	
95th % Queue (ft)	**20**	**37**	**118**		**32**	**133**	**307**	
Approach Delay, LOS	8 sec, LOS A		17.2 sec, LOS C		17.1 sec, LOS C		33.3 sec, LOS D	

Calibrated Model *(future yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								

	NE		SE		SW		NW	
Lane Designations	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	973	1022	860	NA	715	774	1073	NA
Entry Flow Rates, veh/h	158	255	430	NA	179	420	717	NA
V/C ratio	**0.16**	**0.25**	**0.50**		**0.25**	**0.54**	**0.67**	
Control Delay, sec/pcu	**5.2**	**5.9**	**10.8**		**8.0**	**12.7**	**13.2**	
LOS	A	A	B		A	B	B	
95th % Queue (ft)	**15**	**26**	**74**		**26**	**86**	**140**	
Approach Delay, LOS								

v2.1

Bypass Lane Merge Point Analysis (if applicable)

Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
# of Conflicting Exit Flow Lanes	2	2	2	2	2	2
Volumes						
Entry Leg: Insert Right Turn Volume						
Exit Leg: ***(Select Input Method)***						
*Lane Flow in Exit Leg****						
Sum of inner circulatory flow lane to exit leg (leg bypass merges into)	N/A	N/A	N/A	N/A	N/A	N/A
Sum of outer circulatory flow lane to exit leg (leg bypass merges into)	N/A	N/A	N/A	N/A	N/A	N/A
*Critical Lane Flow (Manual) in Exit Leg****						
Volume Characteristics						
PHF (Entry Leg)						
F_{HV} (Entry Leg)						
F_{ped}						
PHF (Exit Leg)***	N/A	N/A	N/A	N/A	N/A	N/A
F_{HV} (Exit Leg)***	N/A	N/A	N/A	N/A	N/A	N/A

******Volume Characteristics are already taken into account for Default method ONLY. Insert Values above if Manual method.***

Entry/Conflicting Flows						
Entry Flow						
Conflicting Critical Flow						
Bypass Lane Results						
Entry Capacity of Bypass, veh/h						
Flow Rates of Exiting Traffic, veh/h						
V/C ratio						
Control Delay, sec/pcu						
LOS						
95th % Queue (ft)						

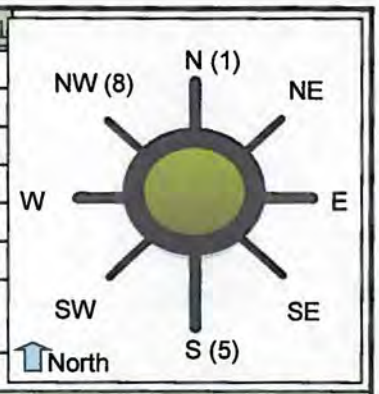
Roundabout Analysis Tool
Multi-Lane

6/10/2015
Version 2.1

General & Site Information

v2.1

Analyst:	Todd Price
Agency/Co:	GDOT
Date:	10/16/2013
Project or PI#:	0009919
Year, Peak Hour:	2038 PM Peak
County/District:	D2 - Newton County
Intersection:	SR 81 @ SR 162 Partial Dual Lane



Volumes

Entry Legs (FROM)

	N1 (1)	N2 (1)	NE1 (2)	NE2 (2)	E1 (3)	E2 (3)	SE1 (4)	SE2 (4)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	SELECT	No Lane
Exit Legs (TO) N (1), vph								
NE (2), vph							115	
E (3), vph								
SE (4), vph			240					
S (5), vph								
SW (6), vph				345			25	
W (7), vph								
NW (8), vph				70			485	
Entry Volume, vph	0	0	240	415	0	0	625	0

	S1 (5)	S2 (5)	SW1 (6)	SW2 (6)	W1 (7)	W2 (7)	NW1 (8)	NW2 (8)
Lane Designation	No Lane	No Lane	Left Only	Right-Thru	No Lane	No Lane	Lf-Th-Rt	No Lane
N (1), vph								
NE (2), vph			155				55	
E (3), vph								
SE (4), vph			25				190	
S (5), vph								
SW (6), vph							65	
W (7), vph								
NW (8), vph			45					
Entry Volume, vph	0	0	225	0	0	0	310	0

	N	NE	E	SE	S	SW	W	NW
# of Entry Flow Lanes	0	2	0	1	0	1	0	1
# of Conflict Flow Lanes	2	2	2	2	2	2	2	2

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	97%	100%	96%	100%	96%	100%	96%
% Heavy Vehicles	0%	4%	0%	4%	0%	4%	0%	4%
% Bicycles	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians (ped/hr)	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{hv}	1.000	0.966	1.000	0.962	1.000	0.962	1.000	0.962

F_{ped}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Entry/Conflicting Flows		N	NE	E	SE	S	SW	W	NW
Flow to	N (1), pcu/h	0	0	0	0	0	0	0	0
Leg #	NE (2), pcu/h	0	0	0	130	0	175	0	62
	E (3), pcu/h	0	0	0	0	0	0	0	0
	SE (4), pcu/h	0	270	0	0	0	28	0	215
	S (5), pcu/h	0	0	0	0	0	0	0	0
	SW (6), pcu/h	0	388	0	28	0	0	0	73
	W (7), pcu/h	0	0	0	0	0	0	0	0
	NW (8), pcu/h	0	79	0	548	0	51	0	0
	Entry flow, pcu/h	0	737	0	707	0	254	0	350
	Entry flow Lane 1, pcu/h	0	270	0	707	0	254	0	350
	Entry flow Lane 2, pcu/h	0	467	0	0	0	0	0	0
	Conflicting flow, pcu/h	0	627	0	288	0	547	0	686

Results: Approach Measures of Effectiveness

HCM 2010 Model *(build yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								

	NE		SE		SW		NW	
Lane Designations	*Left Only*	*Right-Thru*	*Lane 1*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	682	704	888	NA	741	NA	672	NA
Entry Flow Rates, veh/h	261	451	679	NA	245	NA	337	NA
V/C ratio	**0.38**	**0.64**	**0.77**		**0.33**		**0.50**	
Control Delay, sec/pcu	**10.4**	**17.0**	**19.7**		**8.9**		**13.1**	
LOS	B	C	C		A		B	
95th % Queue (ft)	**46**	**121**	**197**		**38**		**73**	
Approach Delay, LOS	14.6 sec, LOS B		19.7 sec, LOS C		8.9 sec, LOS A		13.1 sec, LOS B	

Calibrated Model *(future yr)*	N		E		S		W	
Lane Designations	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*	*No Lane*
Entry Capacity, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
Entry Flow Rates, veh/h	NA	NA	NA	NA	NA	NA	NA	NA
V/C ratio								
Control Delay, s/veh								
LOS								
95th % Queue (ft)								
Approach Delay, LOS								

	NE		SE		SW		NW	
Lane Designations	*Left Only*	*Right-Thru*	*Lane 1*	*No Lane*	*Left Only*	*Right-Thru*	*Lf-Th-Rt*	*No Lane*
Entry Capacity, veh/h	846	901	1217	NA	964	NA	850	NA
Entry Flow Rates, veh/h	261	451	679	NA	245	NA	337	NA
V/C ratio	**0.31**	**0.50**	**0.56**		**0.25**		**0.40**	
Control Delay, sec/pcu	**7.7**	**10.4**	**9.4**		**6.3**		**9.0**	
LOS	A	B	A		A		A	

SR 81 at SR 162

Right Turns Excluded
70% Criteria
Newton County

Signal Warrants - Summary

Major Street Approaches

Northbound: **SR 81**
Number of Lanes: **1**
Approach Speed: **45**
Total Approach Volume: **3,102**

Southbound: **SR 81**
Number of Lanes: **1**
Approach Speed: **45**
Total Approach Volume: **3,973**

Minor Street Approaches

Eastbound: **SR 162**
Number of Lanes: **1**
Total Approach Volume: **3,628**

Westbound: **SR 162**
Number of Lanes: **1**
Total Approach Volume: **3,477**

Warrant Summary (Rural values apply.)

Warrant 1 - Eight Hour Vehicular Volumes ..... Satisfied

Warrant 1A - Minimum Vehicular Volume ..... Satisfied
Required volumes reached for 11 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic ..... Not Satisfied
Required volumes reached for 1 hours, 8 are needed

Warrant 1 A&B - Combination of Warrants ..... Not Satisfied
Required volumes reached for 6 hours, 8 are needed

Warrant 2 - Four Hour Volumes ..... Satisfied
Number of hours (11) volumes exceed minimum >= minimum required (4).

Warrant 3 - Peak Hour ..... Satisfied

Warrant 3A - Peak Hour Delay ..... Not Satisfied
Total approach volumes and delays on minor street do not exceed minimums for any hour.

Warrant 3B - Peak Hour Volumes ..... Satisfied
Volumes exceed minimums for at least one hour.

Warrant 4 - Pedestrian Volumes ..... Not Satisfied
Required 4 Hr pedestrian volume reached for 0 hour(s) and the single hour volume for 0 hour(s)

Warrant 5 - School Crossing ..... Not Satisfied
Number of gaps > .0 seconds (0) exceeds the number of minutes in the crossing period (0).

Warrant 6 - Coordinated Signal System ..... Not Satisfied
No adjacent coordinated signals are present

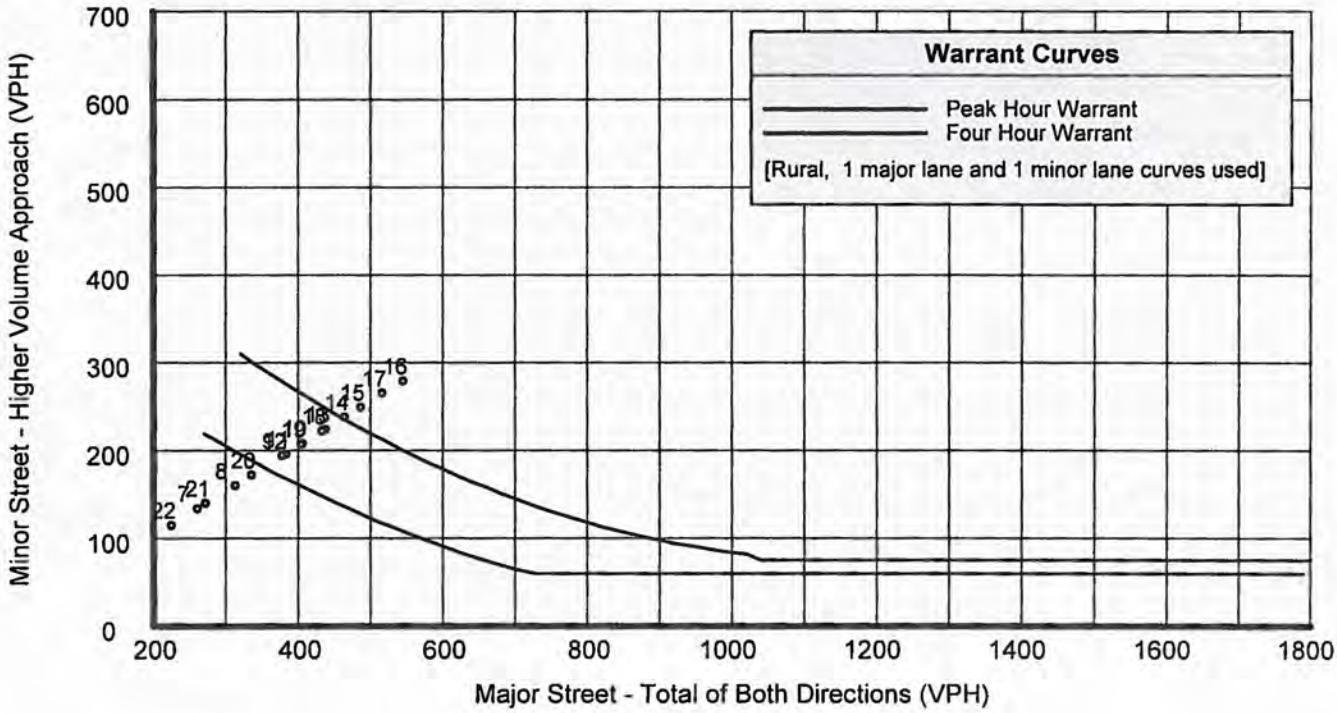
Warrant 7 - Crash Experience ..... Not Satisfied
Number of accidents (-1) is less than minimum (5). Volume minimums are met.

Warrant 8 - Roadway Network ..... Not Satisfied
Major Route conditions not met. One or more volume requirement met.

SR 81 at SR 162

Right Turns Excluded
70% Criteria
Newton County

Signal Warrants - Summary

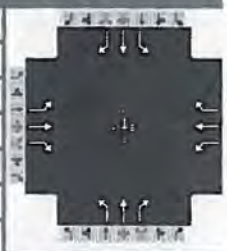


Analysis of 8-Hour Volume Warrants:

Hour	Major	Higher Minor		War-1A			War-1B			War-1A&B		
Begin	Total	Vol	Dir	Major Crit	Minor Crit	Meets?	Major Crit	Minor Crit	Meets?	Major Crit	Minor Crit	Meets?
00:00	134	69	EB	350-No	105-No	---	525-No	53-Yes	Minor	420-No	84-No	---
01:00	93	48	EB	350-No	105-No	---	525-No	53-No	---	420-No	84-No	---
02:00	64	33	EB	350-No	105-No	---	525-No	53-No	---	420-No	84-No	---
03:00	54	28	EB	350-No	105-No	---	525-No	53-No	---	420-No	84-No	---
04:00	54	28	EB	350-No	105-No	---	525-No	53-No	---	420-No	84-No	---
05:00	75	38	EB	350-No	105-No	---	525-No	53-No	---	420-No	84-No	---
06:00	179	92	EB	350-No	105-No	---	525-No	53-Yes	Minor	420-No	84-Yes	Minor
07:00	261	134	EB	350-No	105-Yes	Minor	525-No	53-Yes	Minor	420-No	84-Yes	Minor
08:00	313	160	EB	350-No	105-Yes	Minor	525-No	53-Yes	Minor	420-No	84-Yes	Minor
09:00	378	194	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-No	84-Yes	Minor
10:00	406	208	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-No	84-Yes	Minor
11:00	383	196	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-No	84-Yes	Minor
12:00	378	194	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-No	84-Yes	Minor
13:00	438	224	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-Yes	84-Yes	Both
14:00	464	238	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-Yes	84-Yes	Both
15:00	486	249	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-Yes	84-Yes	Both
16:00	545	279	EB	350-Yes	105-Yes	Both	525-Yes	53-Yes	Both	420-Yes	84-Yes	Both
17:00	516	265	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-Yes	84-Yes	Both
18:00	433	222	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-Yes	84-Yes	Both
19:00	404	207	EB	350-Yes	105-Yes	Both	525-No	53-Yes	Minor	420-No	84-Yes	Minor
20:00	335	172	EB	350-No	105-Yes	Minor	525-No	53-Yes	Minor	420-No	84-Yes	Minor
21:00	272	140	EB	350-No	105-Yes	Minor	525-No	53-Yes	Minor	420-No	84-Yes	Minor
22:00	225	115	EB	350-No	105-Yes	Minor	525-No	53-Yes	Minor	420-No	84-Yes	Minor
23:00	185	95	EB	350-No	105-No	---	525-No	53-Yes	Minor	420-No	84-Yes	Minor

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	GDOT			Duration, h	0.25
Analyst	Todd Price	Analysis Date	7/17/2013	Area Type	Other
Jurisdiction		Time Period	2015 AM Peak	PHF	1.00
Intersection	SR 81 @ SR 162	Analysis Year	2015	Analysis Period	1> 7:00
File Name	2018 AM Peak Sig.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	50	315	70	30	145	80	110	230	20	95	130	25

Signal Information												
Cycle, s	60.0	Reference Phase	2									
Offset, s	0	Reference Point	Begin	Green	35.6	14.4	0.0	0.0	0.0	0.0		
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	0.0	0.0	0.0		

Timer Results	S EBL	S EBT	N WBL	N WBT	NB BL	NB BT	SB L	SW SB T
Assigned Phase		2		6		8		4
Case Number		5.0		5.0		5.0		5.0
Phase Duration, s		40.6		40.6		19.4		19.4
Change Period, (*Y+Rc*), s		5.0		5.0		5.0		5.0
Max Allow Headway (*MAH*), s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						10.1		13.2
Green Extension Time (g_e), s		0.0		0.0		1.1		1.1
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

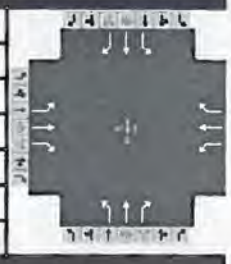
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	50	315	70	30	145	80	110	230	20	95	130	25
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1214	1827	1548	1040	1827	1548	1231	1827	1548	1124	1827	1548
Queue Service Time (g_s), s	1.1	5.1	1.2	0.9	2.1	1.3	4.8	6.6	0.6	4.8	3.5	0.7
Cycle Queue Clearance Time (g_c), s	3.4	5.1	1.2	6.2	2.1	1.3	8.1	6.6	0.6	11.2	3.5	0.7
Capacity (*c*), veh/h	792	1081	916	643	1081	916	349	441	374	272	441	374
Volume-to-Capacity Ratio (*X*)	0.063	0.291	0.076	0.047	0.134	0.087	0.315	0.521	0.053	0.349	0.295	0.067
Available Capacity (c_a), veh/h	792	1081	916	643	1081	916	955	1340	1135	825	1340	1135
Back of Queue (*Q*), veh/ln (50th percentile)	0.2	1.4	0.3	0.2	0.6	0.3	1.2	2.4	0.2	1.1	1.3	0.2
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	6.2	6.0	5.2	7.6	5.4	5.3	21.8	19.7	17.5	24.5	18.6	17.5
Incremental Delay (d_2), s/veh	0.2	0.7	0.2	0.1	0.3	0.2	0.2	0.4	0.0	0.3	0.1	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	6.4	6.7	5.4	7.8	5.7	5.5	22.0	20.1	17.5	24.8	18.7	17.6
Level of Service (LOS)	A	A	A	A	A	A	C	C	B	C	B	B
Approach Delay, s/veh / LOS	6.5	A		5.9	A		20.5	C		20.9	C	
Intersection Delay, s/veh / LOS	13.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.4	B	2.4	B	2.4	B
Bicycle LOS Score / LOS	1.2	A	0.9	A	1.1	A	0.9	A

Copyright © 2012 University of Florida, All Rights Reserved.

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	GDOT			Duration, h	0.25
Analyst	Todd Price	Analysis Date	7/17/2013	Area Type	Other
Jurisdiction		Time Period	2018 PM Peak	PHF	1.00
Intersection	SR 81 @ SR 162	Analysis Year	2018	Analysis Period	1> 7:00
File Name	2018 PM Peak Sig.xus				
Project Description					



Demand Information	S EB			N WB			NE EB			SW WB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	35	190	45	15	315	75	30	105	15	155	235	45

Signal Information													
Cycle, s	60.0	Reference Phase	2										
Offset, s	0	Reference Point	Begin	Green	37.1	12.9	0.0	0.0	0.0	0.0			
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	S EBL	S EBT	N WBL	N WBT	NE EBL	NE EBT	SW WBL	SW WBT
Assigned Phase		2		6		8		4
Case Number		5.0		5.0		5.0		5.0
Phase Duration, s		42.1		42.1		17.9		17.9
Change Period, $(Y+R_c)$, s		5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0		3.1		3.1
Queue Clearance Time (g_s), s						10.3		11.8
Green Extension Time (g_e), s		0.0		0.0		1.1		1.1
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

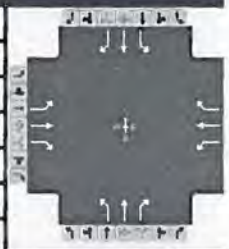
Movement Group Results	S EB			N WB			NE EB			SW WB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate *(v)*, veh/h	35	190	45	15	315	75	30	105	15	155	235	45
Adjusted Saturation Flow Rate *(s)*, veh/h/ln	1040	1827	1548	1166	1827	1548	1119	1827	1548	1259	1827	1548
Queue Service Time (g_s), s	1.0	2.7	0.7	0.3	4.8	1.2	1.5	2.9	0.5	7.0	6.9	1.4
Cycle Queue Clearance Time (g_c), s	5.9	2.7	0.7	3.1	4.8	1.2	8.3	2.9	0.5	9.8	6.9	1.4
Capacity *(c)*, veh/h	676	1126	954	785	1126	954	235	397	336	335	397	336
Volume-to-Capacity Ratio *(X)*	0.052	0.169	0.047	0.019	0.280	0.079	0.128	0.265	0.045	0.463	0.592	0.13
Available Capacity (c_a), veh/h	676	1126	954	785	1126	954	831	1370	1161	1006	1370	1161
Back of Queue *(Q)*, veh/ln (50th percentile)	0.2	0.7	0.2	0.1	1.3	0.3	0.4	1.1	0.1	1.8	2.6	0.4
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio *(RQ)* (50th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	6.7	4.9	4.6	5.6	5.3	4.6	24.8	19.5	18.6	23.5	21.1	18.9
Incremental Delay (d_2), s/veh	0.1	0.3	0.1	0.0	0.6	0.2	0.1	0.1	0.0	0.4	0.5	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay *(d)*, s/veh	6.9	5.3	4.6	5.7	6.0	4.8	24.9	19.6	18.6	23.9	21.6	19.0
Level of Service (LOS)	A	A	A	A	A	A	C	B	B	C	C	B
Approach Delay, s/veh / LOS	5.4	A		5.7	A		20.6	C		22.2	C	
Intersection Delay, s/veh / LOS	13.1						B					

Multimodal Results	S EB		N WB		NE EB		SW WB	
Pedestrian LOS Score / LOS	2.4	B	2.4	B	2.4	B	2.4	B
Bicycle LOS Score / LOS	0.9	A	1.2	A	0.7	A	1.2	A

Copyright © 2012 University of Florida, All Rights Reserved.

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	GDOT			Duration, h	0.25
Analyst	Todd Price	Analysis Date	7/17/2013	Area Type	Other
Jurisdiction		Time Period	2038 AM Peak	PHF	1.00
Intersection	SR 81 @ SR 162	Analysis Year	2038	Analysis Period	1> 7:00
File Name	2038 AM Peak Sig.xus				
Project Description					



Demand Information	SEB			NWB			NE EB			SW WB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	75	480	105	40	225	130	165	355	30	145	195	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	42.8	27.2	0.0	0.0	0.0	0.0					
Yellow	3.0	3.0	0.0	0.0	0.0	0.0					
Red	2.0	2.0	0.0	0.0	0.0	0.0					

Timer Results	SEBL	SEBT	NWBL	NWBT	NEEBL	NEEBT	SWWBL	SWWBT
Assigned Phase		2		6		8		4
Case Number		5.0		5.0		5.0		5.0
Phase Duration, s		47.8		47.8		32.2		32.2
Change Period, $(Y+R_c)$, s		5.0		5.0		5.0		5.0
Max Allow Headway *(MAH)*, s		0.0		0.0		3.2		3.2
Queue Clearance Time (g_s), s						17.8		25.4
Green Extension Time (g_e), s		0.0		0.0		1.9		1.9
Phase Call Probability						1.00		1.00
Max Out Probability						0.00		0.00

Movement Group Results	SEB			NWB			NE EB			SW WB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	75	480	105	40	225	130	165	355	30	145	195	40
Adjusted Saturation Flow Rate (s), veh/h/ln	1129	1827	1548	894	1827	1548	1160	1827	1548	1002	1827	1548
Queue Service Time (g_s), s	3.0	13.2	2.7	2.4	5.2	3.4	9.8	12.7	1.0	11.0	6.3	1.4
Cycle Queue Clearance Time (g_c), s	8.5	13.2	2.7	16.0	5.2	3.4	15.8	12.7	1.0	23.4	6.3	1.4
Capacity (c), veh/h	617	978	829	416	978	829	396	620	526	275	620	526
Volume-to-Capacity Ratio (X)	0.122	0.491	0.127	0.096	0.230	0.157	0.416	0.572	0.057	0.528	0.314	0.07
Available Capacity (c_a), veh/h	617	978	829	416	978	829	641	1005	852	486	1005	852
Back of Queue (Q), veh/ln (50th percentile)	0.7	4.9	0.8	0.5	1.9	1.1	2.5	5.0	0.3	2.5	2.4	0.5
Overflow Queue (Q_3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (RQ) (50th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	12.2	11.7	9.3	16.9	9.8	9.4	25.3	21.7	17.8	31.1	19.5	17.9
Incremental Delay (d_2), s/veh	0.4	1.8	0.3	0.5	0.5	0.4	0.3	0.3	0.0	0.6	0.1	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	12.6	13.5	9.6	17.3	10.4	9.8	25.5	22.0	17.8	31.7	19.6	17.9
Level of Service (LOS)	B	B	A	B	B	A	C	C	B	C	B	B
Approach Delay, s/veh / LOS	12.7	B		10.9	B		22.8	C		24.1	C	
Intersection Delay, s/veh / LOS	17.3						B					

Multimodal Results	SEB		NWB		NE EB		SW WB	
Pedestrian LOS Score / LOS	2.4	B	2.4	B	2.4	B	2.4	B
Bicycle LOS Score / LOS	1.6	A	1.1	A	1.4	A	1.1	A

Copyright © 2012 University of Florida, All Rights Reserved.

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INDICATION OF ROUNDABOUT SUPPORT

To the Georgia Department of Transportation:

Attn: State Traffic Engineer
935 E. Confederate Ave, Building 24
Atlanta, GA 30316

Location

The Board of Commissioners in Newton County supports the consideration of a roundabout at the location specified below.

Local Street Names: N/A

State/County Route Numbers: SR 81 at SR 162

Associated Conditions

The undersigned agrees to participate in the following maintenance of the intersection in the event that the roundabout is selected as the preferred concept alternative:

- The full and entire cost of the electric energy used for any lighting installed (if needed)
- Any maintenance costs associated with the landscaping (after construction is complete)

We agree to participate in a formal Local Government Lighting Project Agreement during the preliminary design phase. This indication of support is submitted and all of the conditions are hereby agreed to. The undersigned are duly authorized to execute this agreement.

This is the 5th day of April, 2011

Attest:

Jackie Smith Clerk

By: Kathryn G. Morgan

Title: Chairman

GDOT Comment Responses shown in RED. Final response Date: June 9, 2015

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
225 E Robinson Street, Suite 450, Orlando, FL 32801 407.540.0555 407.540.0550

TECHNICAL MEMORANDUM

SR 81 at SR 162 (Newton County)
GDOT PI#: 0009919

Roundabout Peer Review

Date: April 22, 2015 Project#: 13518.02

To: Todd Price, GDOT District Design Engineer

From: Justin Bansen, P.E.

Kittelson & Associates, Inc. (KAI) reviewed the feasibility study for intersection alternatives at SR 81/SR 162 in Newton County, Georgia. The feasibility study was prepared by the Georgia Department of Transportation (GDOT) and is dated March 9, 2015. GDOT provided the following information for KAI's review:

- The Feasibility Study report dated 3/9/15;
- Draft Project Concept Report (undated, received on 03/09/15), and
- MicroStation file for roundabout design alternative (files dated 03/10/15).

Our review has been conducted in general accordance with the guidance provided in NCHRP Report 672, *Roundabouts: An Informational Guide, Second Edition* (Reference 1) and our experience with peer reviews of this type. It is recognized that the intersection site presents a number of challenges, including skewed intersection approaches and constrained right-of-way. The recommended alternative presented in the feasibility study does not adequately accommodate the WB-67 design vehicle for some movements and also requires further refinement in order to easily transition into a well-designed multilane configuration in the future.

FEASIBILITY STUDY REPORT

KAI reviewed the Feasibility Study Report dated March 9, 2015 The report provides content on the intersection's background and site conditions, traffic volumes, safety assessment, operational analyses, cost comparison, and selection of the preferred alternative. There is no content included in the report regarding concept designs or associated performance checks for fastest vehicle path, truck accommodation, etc. Our comments on specific elements contained in the report include the following:

Operational Analysis

1. For the analysis of the existing all-way stop configuration, shared left-through-right lanes are assumed for all approaches. However, the existing condition has a yield controlled bypass in the SW quadrant of the intersection that serves the eastbound right-turn and the northbound left-turn movements. The current analysis is expected to provide a conservative estimate of the all-way stop operations. Removing the bypass movement volumes from the all-way stop analysis would provide a more realistic assessment of the no-build operations. The operations

of the yield controlled bypass lanes could be approximated by applying the same methods used for roundabout analysis (determining capacity based upon conflicting flows). Bypass movements were removed from the analysis.

2. For the roundabout analysis, SIDRA 5.1 was used as one of the software tools. A newer version of SIDRA (version 6) is available and will yield slightly different results. Operational analysis utilizing SIDRA 6 is documented in previous memos provided to GDOT by KAI. SIDRA SIDRA 5.1 is the current analysis tool that is available to the Designer. DOT's IT department was consulted and version 6 is not available for the designers used at this time.

3. The roundabout diagrams shown on Pages 4, 6, and 8 indicate different central island diameters between the single-lane and multilane configurations. The various roundabout analyses use a 60-foot island diameter (92-foot lCD), 150-foot central island diameter (182-foot lCD), and 100-foot island diameter (160-foot lCD). The island diameter plays a relatively small role in the analysis results and updating this parameter is not expected to change the conclusions of the analysis. However, given that the intent is to have an initial single-lane roundabout that later is easily expanded to a multilane configuration, a consistent central island diameter would be required for expansion toward the outside. Therefore, the diameters indicated in the lane configuration illustrations should not be carried forward to the design. Diameter shown were used for basic modeling. These will not be carried forward in the design.

4. The lane configurations used in the SIDRA analysis for Alternative 3 should be modified to adjust the bypass configuration and/or reduce the number of exit lanes. The lane configurations shown in Figure 6 also do not match up with the concept design. There are a couple of possible options:

   a. If yield controlled right-turn lanes are used on the EB, WB, and SB approaches, then the SB, WB, and NB exits should be reduced to a single lane.

   b. If the intent was to provide a channelized right-turn bypass lane (island separating right-turn lane from the entry lane) but keep the right-turn bypass lane yield controlled, then the right-turn lane type in SIDRA should be changed to "Slip/Bypass (High Angle)" and single-lane exits provided on all approaches.

   c. If the intent was to provide a free-flow channelized right-turn bypass (as is indicated in the concept drawings), then the right-turn lane type in SIDRA should be changed to "Slip/Bypass (Low Angle)".

   Option B was the designer intent. The SIDRA model will be revised to reflect this.

5. For Alternative 4, a partial multilane roundabout is expected to provide sufficient capacity for the forecast 2038 peak hour volumes. Previous analysis by KAI in May 2014 recommended two entering and exiting lanes along SR 81 with one entering and exiting lane along SR 162. Due to the intersection skew angle, providing fewer lanes along the SR 162 approaches will simplify the roundabout operations, reduce conflict points, and allow more flexibility for design of the ultimate roundabout while minimizing ROW impacts. In order to maximize safety, we recommend providing the fewest lanes necessary to provide adequate operations through the design year.
   Lanes will be reduced on SR 162 as noted. Model will be revised to reflect.

6. The addition of right-turn bypass lanes on the EB and WB approaches of SR 162 provide a slight benefit of reducing delays. However, they are not required in order to achieve acceptable capacity through the design year and could be omitted unless needed to facilitate

truck turn movements. In particular, the WB approach does not appear to need the bypass lane for truck accommodation and the bypass lane could be removed to simplify operations, reduce impacts to adjacent property, and minimize future reconstruction if the roundabout is expanded to a multilane configuration in the future.
Bypass lanes were included for analysis purpose. Bypass lanes will not be included in the final design.

7. On the SB approach, the use of a right-turn bypass lane would extend the life of the single-lane southbound entry and may allow the single-lane entry to provide acceptable capacity through the design year 2038. However, due to the skewed configuration of the intersection, the use of a right-turn bypass lane is not compatible with an ultimate partial two-lane roundabout if one ends up being needed in the future. If the roundabout needs to be converted to a partial multilane configuration in the future, then the bypass lane would need to be removed at that point. The right-turn bypass lane also creates more substantial impacts to the adjacent properties and complicates property access. The single-lane entry (without the bypass) is expected to operate acceptably for at least 15 years after opening and could provide acceptable operations through the design year if actual volume growth ends up being slightly less than predicted. Therefore, consideration could be given to delaying construction of a southbound bypass lane until it is needed. If GDOT elected to convert the roundabout to a partial multilane configuration in the future (in order to provide improved capacity for the NB approach as well), then the southbound right-turn bypass lane may never be needed.
Bypass lanes were included for analysis purpose. Bypass lanes will not be included in the final design.

8. No detailed review of the cost estimates was undertaken. No concept drawing for the Alternative 2 (single-lane roundabout), signalized intersection option was provided with which to be able to review the geometry and ROW needs for that alternative.
Only the preferred alternative layout was provided for a detailed review.

9. Appendix Page E9, the volume of the westbound left-turn movement should be 40 vehicles (analysis output shows 25 vehicles).
Report printout will be revised.

10. Appendix Page F3 – for the 2018 AM peak hour signalized option, the NW Bound through volume should be 145 vehicles (analysis output shows 45 vehicles).
Report printout will be revised.

Concept Report

11. Page 3, Paragraph 1and 2: The primary justification for the roundabout from the feasibility study is for improved operations. The 1st paragraphs of the concept report focuses on safety. We suggest expanding the discussion regarding operations in the concept report and reduce the discussion related to safety since it is more of a secondary benefit.
    Rejected – After discussion with Traffic Operations it was decided that the 2004-2008 crash information should stay in the study since this was what the project was programmed based upon.

12. Page 3, Paragraphs 3 and 5: The traffic volume information contained in these two paragraphs conflict with each other. It appears that one of the two paragraphs could be deleted, since the information is redundant.
    Paragraph 3 will be deleted and traffic volumes will be verified to ensure that they are correct.

13. Page 3, Paragraph 4: We suggest that the entire paragraph related to the crash data be eliminated and replaced with more recent data summarized in the feasibility study. The information in the concept report tells a drastically different story than what is discussed in the feasibility study. From 2004 to 2008, there were 40 crashes (average of 8 per year). However, from 2009 to 2013 there were only 6 crashes (average of 1.2 per year) with no injuries or fatalities. The most recent 5 years of data suggests that the previous crash problem may have been addressed through prior improvements. The most recent 5 years of crash data appears to be more appropriate to include in the concept report.
    Rejected – After discussion with Traffic Operations it was decided that the 2004-2008 crash information should stay in the study since this was what the project was programmed based upon.

    Page 3 Paragraph 4: The statistics cited from "studies" of roundabouts reflect generalized information. When converting from an all-way stop control condition to a roundabout, the roundabout is expected to provide similar safety performance to the all-way stop condition based upon data summarized in NCHRP Reports 572 and 672. Therefore, the roundabout may still provide some safety benefit (particularly related to reducing chances for high-speed severe crashes); however, it is not expected to provide the crash reductions currently cited in the concept report.
    Rejected – After discussion with Traffic Operations it was decided that the 2004-2008 crash information should stay and that this paragraph should remain as is.

14. Page 4: The mainline function class is listed as a "Rural Major Collector". Elsewhere in the report, it is listed in several places as an "Urban Minor Arterial".
    Corrected to Urban Minor Arterial.

15. Page 5 and 6: the circulatory lane width in the roundabout is listed as 16 feet Given the context and WB-67 design vehicle, considering increase the circulatory roadway lane width (for the initial single-lane configuration) to the 18 to 20 foot range

    Lanes will be revised to 20 feet.

16. Page 12: Update the rationale for the preferred alternative to remove the sentence "The bypass lanes are needed in order to reduce traffic volumes in the circle". The bypass lanes would remove the right-turn traffic from the entry lanes, allowing the entries to operate better. The bypass lanes do not necessarily change the capacity of the entries (since the right-turns never conflicted with the downstream entries), but rather the bypass lanes reduce the entry volume to achieve a better vIc ratio.
    Preferred alternative has been updated to a single lane roundabout on a multilane footprint after conversations with Kittleson and Atlanta Traffic Ops. Bypass lanes will not be in final design.

17. Page 12 and 13: it is not clear what the difference is between the two signal options (Alternatives 2 and 3) listed in the Concept Report
    Report will be revised to show Alternate 2 will be a signal at the current location with on major changes to the skew angle. Alternative 3 is a realignment of the intersection to bring the intersection in more at a 90 degree angle.

18. Typical sections: For the SR 81/SR 162 approach typical sections, the lane width does not appear to account for any sort of buffer next to the splitter island. Typically there is a one-foot buffer between the face of curb and the lane line along the edge of the marked splitter island envelope.
    Typical section will be revised to show the 1' buffer.

19. Consider updating the typical section to widen the circulatory roadway to the 18 to 20 foot range. Also see Comment 16.

    Lanes will be revised to 20 feet.

PREFERRED ALTERNATIVE GEOMETRIC REVIEW

For the opening year roundabout layout (single-lane roundabout with right-turn bypass lanes), KAI performed additional geometric review to verify fastest paths speed control and WB-67 design vehicle accommodations. Additionally, the geometry was reviewed relative to vehicle channelization, multimodal accommodations, and general roundabout dimensions.

This review is based on the roundabout design with an lCD of 180 feet, corresponding to the Microstation file "000919-Layout File". No fastest path or design vehicle checks were completed by GDOT for use in the review.

Design checks were performed for the single-lane roundabout alternative only. The two-lane roundabout design provided to KAI represents a complete reconstruction of the intersection with relocation of the roundabout. Due to more fundamental issues related to the geometry of the two-Jane concept, no detailed fastest path or design vehicle checks were performed on the two-Jane roundabout option.

Design Vehicle Accommodation

20. KAI prepared independent checks of the opening year single-lane design for selected

movements to review accommodation of the WB-67 design vehicle. As illustrated in the attachments, the WB-67 design vehicle is expected to track over the outside curbline for right-turn movements for both SR 162 approaches (traveling along the bypass lanes) as well as the NB SR 81 to EB SR 162 movement. In addition, for the through movements along SR 162, the WB-67 truck trailer is expected to track over the splitter island separating the entry Jane from the right-turn bypass lane. Additional refinement is needed to improve truck accommodation while continuing to maintain acceptable fastest path speed control.
Design will be revised to accommodate for WB-67 movements.

21. Truck turn templates for fuel delivery vehicles should be evaluated to verify that adequate circulation can be provided to the adjacent fueling stations on the SE and SW corners of the intersection.
All movements including adjacent commercial accesses for deliveries will be designed for WB-67 accommodation.

Fastest Path Speeds

22. The single-lane design provides acceptable entry speeds on each approach. The fastest path speeds of 21 to 22 mph on the SB, EB, and WB approaches are below the recommended threshold of 25 mph. This suggests that there is some flexibility in the design for adjusting the entries for better truck accommodation while still maintaining entry speeds below 25 mph.
Design will be revised to accommodate for marinating a 25 mph speed.

23. For the SB SR 81 to WB SR 162 bypass, speeds in excess of 35 mph are possible. Extending the splitter island that separates the bypass lane from the entry lane on the SR 81 approach and from the exit lane on the SR 162 exit, will help to better channelize vehicles and reduce speeds through the right turn movement. However, additional adjustment to the radius of the right-turn bypass may also be necessary to maintain consistent speeds for vehicles merging from the roundabout exit and bypass lanes on WB SR 162.
Noted- Bypass lanes will not be included in the final design.

24. Adjustment to the WB SR 162 to NB SR 81 right-turn bypass is also needed to reduce speeds. A fastest path speed of 27 mph is predicted based upon the current design. Extending the splitter islands separating the right-turn bypass from the roundabout entry and exit lanes will help to better channelize vehicles and is expected to bring the bypass speed below the 25 mph threshold.
Noted- Bypass lanes will not be included in the final design

Multimodal Accommodation

25. No pedestrian or bicycle amenities were identified in the concept layout. Given the proximity to the head start school and other adjacent commercial properties, sidewalk or multiuse paths around the roundabout are recommended.
    Final design will accommodate for full pedestrian facilities and bike facilities will be fully evaluated.

26. Please illustrate the crosswalk locations across the right-turn by-pass lanes. Some of the typical alignments for the crosswalks at the right-turn bypass lanes could be referred to Section 6.8.6 of the NCHRP Report 672.
    Cross walk location will be shown in the conceptual layouts.

27. Extend the length of the islands to separate the right-turn bypasses from the roundabout entry and exit lanes and provide a minimum 6-foot wide pedestrian refuge at all locations with right-turn bypass lanes. In particular on the NB and WB exits, an island is needed between the roundabout exit lane and the bypass lane to both control speeds and provide for a pedestrian refuge. Extension of the islands through these exits also prevents vehicles from inappropriately entering the circulatory roadway from the right-turn bypass lane.
    Noted - Bypass lanes will not be included in the final design but all island designs will be reevaluated.

Access Management

28. On the south leg of the intersection, it is unclear how access is being provided to Bailey Drive for vehicles traveling southbound on SR 81. It appears that a reduction in the length of the raised splitter island to approximately 100 feet could be provided in order to improve access to Bailey Drive. However, the length of the merge area for the EB to SB right-turn bypass lane may need to be extended to avoid having the merge area in the same location as vehicles slowing to make a left-turn onto Bailey Drive. To compensate for the shorter splitter island, other treatments (such as cross-sectional changes, signing and markings, etc.) upstream of the intersection should be used to support vehicle speed reductions in advance of the roundabout.
    Noted -The type of access to Bailey Drive (full, limited movements, etc.) will be evaluated as we go deeper in the design.

29. On the north leg of the intersection, consideration could be given to shortening the raised splitter island to approximately 200 feet in length to allow access to the commercial properties (former pizza restaurant and Dollar General) on the east side of SR 81. Alternative access is currently provided to the commercial parcels via Hillcrest Road; however, this road

appears to be a narrow local street that is approximately 12 feet wide and would not readily provide accommodation for two-way traffic.
Noted -The type of access to all driveways (full, limited movements, etc.) will be evaluated as we go deeper in the design.

On the west leg of the intersection, it is unclear whether left-turn access is needed into the parcels on the north side of SR 162 within 300 feet of the intersection where the splitter island is currently shown. While the longer splitter island is desirable, consideration could be given to reducing the length of the splitter island based upon access needs.
Noted -The type of access to all driveways (full, limited movements, etc.) will be evaluated as we go deeper in the design.

General Geometric Comments

An illustration of the issues on the general geometry (together with the multi modal accommodation illustration) is attached. Detailed comments are provided below.

30. The envelope of each splitter island is approximately 4 feet wide. It is unclear whether a 4-foot wide raised island is proposed (no buffer to the adjacent travel lane) or whether a 2-foot wide raised island is proposed (with 1foot buffer on each side of the splitter island). Under either scenario, a wider splitter island is desirable to increase visibility of the island given the higher approach speeds.
Noted- splitter island width will vary based on final design. A 1 foot buffer will be included between the travel lane and the island.

31. Consider modifying the splitter islands to offset the approach noses and provide appropriate nose radii to improve vehicle channelization. NCHRP Report 672 provides additional detail in Exhibit 6-13. Some adjustment to the approach or departure curblines may be necessary in order to provide the necessary width to achieve the desired splitter island offset.
Noted – will incorporate this into the final design.

32. The concept design provided by GDOT for review shows only the edge-of-pavement. Curb and gutter is assumed to also be proposed around the roundabout; however, it is unclear where the curb and gutter is proposed to start and end.
Curb and gutter is proposed for this intersection design.

33. On the east leg of the intersection, the back to back curves create a kink in the approach alignment. Consider smoothing out the approach geometry by introducing a tangent between the reverse curves.
Will consider as we begin working on the final designs.

34. Consider adjusting the geometry of all entries to better align vehicles into the circulatory roadway and provide channelization that reduces the potential for drivers to run into the central island. If the channelization on the NB and WB approaches cannot be modified (due to truck accommodation needs) then landscape placement should be adjusted accordingly to avoid fixed objects in the potential vehicle paths.
Will consider as we begin working on the final designs.

35. The 180 foot diameter utilized for the design is generally reasonable where designing for future expansion to a multilane configuration. However, the concepts provided by GDOT indicate that the center of the future multilane roundabout would be shifted towards the

northwest. Therefore, the future multilane roundabout would represent a complete reconstruction of the intersection.

a. If full future reconstruction is GDOT's desired approach, then a smaller initial footprint could be utilized for the opening-year single-lane design to reduce initial impacts.

b. If the intent is to minimize future reconstruction when transitioning from the interim to the ultimate design, then the ultimate roundabout design needs to be established first and then lanes taken away to achieve the opening-year design. Substantial modification to the current multilane concept would be required. Given the magnitude of changes needed, full design checks have not been performed on the ultimate design. Below are general observations regarding the ultimate layout.

Noted- Final design will be a single lane roundabout on a multilane roundabout footprint for ease of future conversion.

Ultimate Multilane Roundabout Concept- General Comments/Observations

36. Adjustment to the lane configurations is required based upon the operational analysis comments. Single-lane entries and exits should be provided on the EB and WB SR 162 approaches. The current design with multilane entries and exits on all approaches would result in exiting/circulating conflicts near the WB exit due to the distance between the north and west legs.
    Noted - All bypass lanes will be removed from single lane design and all geometry will be reevaluated.

37. Geometry of the roundabout entries and exits would result in potential for vehicle path overlap on all entries and exits.
    Noted - All geometry will be reevaluated

38. The small entry and exit radii are not expected to accommodate the WB-6 7 design vehicle.
    Final Design will be revised to accommodate for WB-67 movements.

39. The roundabout provides insufficient speed control for the northbound through movement
    Noted -Final Design will accommodate for sufficient speed control.

REFERENCES

1. Rodegerdts, L., J. Bansen, C. Tiesler, J. Knudsen, E. Myers, M. Johnson, M. Maule, B. Persaud, C. Lyon, S. Hallmark, H. Isebrands, R. B. Crown, B. Guichet, and A. O'Brien. *NCHRP Report 672: Roundabouts: An Informational Guide, Second Edition.* Transportation Research Board of the National Academies, Washington, D.C., 2010.
2. Rodegerdts, L., M. Blagg, E. Wemple, E. Myers, M. Kyte, M. Dixon, G. List, A. Flannery, R. Troutbeck, W. Brilon, N. Wu, B. Persaud, C. Lyon, D. Harkey, and D. Carter. *NCHRP Report 572: Roundabouts in the United States.* Transportation Research Board of the National Academies, Washington, D.C., 2007.
3. U.S. Department of Transportation Federal Highway Administration. Crash Modification Factors Clearinghouse. Retrieved February 12, 2015, from http:/jwww.cmfclearinghouse.org

PI No. 0009919 Newton County
Roundabout Safety Project at SR 81 @ SR 162

Concept Meeting Minutes

On Tuesday, July 21, the concept meeting for the SR 81 @ SR 162 safety roundabout project was held at 10:00 A.M. in the District 2 Area 5 Madison office Conference Room. The attendees are shown on the attached sign-in sheet.

Todd Price began the meeting by describing the project, existing and future traffic, and functional classification. H e then discussed the context of the preferred solution in the draft concept report. Todd also requested crash data from Traffic Operations (Ken Werho). Ken Werho then stated he would get Todd the crash data from 2004 to 2008, which Ken stated was the time frame pulled when the project was set up as a safety project.

During the utility involvement discussion, Matthew Sammons stated that SUE services B or C is recommended for this project. He also recommended trying to avoid the AT&T remote terminal site located in the southwest corner of the proposed project. He also stated during the meeting that PID would not be required for this project. Matthew provided a hard copy of their estimate.

The discussion then turned to staging of the project for construction. Ken Werho stated that he saw no problems staging the intersection during construction at its current location. The concept team agreed with Ken's assement of staging.

The intersection alternatives discussed were (1)roundabout at current intersection location, (2) signalized intersection at current location, and (3) signalized intersection southwest from current location. The preferred option is the roundabout at current location of the intersection of SR 81 @ SR 162.

The let date for the project is Nov. 2017 .

The meeting was adjourned.